The Complete Guide to

# NO-DIG GARDENING

Easy
Eco-Friendly
Sustainable

Grow beautiful vegetables, herbs, and flowers—the easy way!

## LAYER YOUR WAY TO HEALTHY SOIL

**Eliminate tilling and digging • Build a productive garden naturally**
**Reduce weeding and watering**

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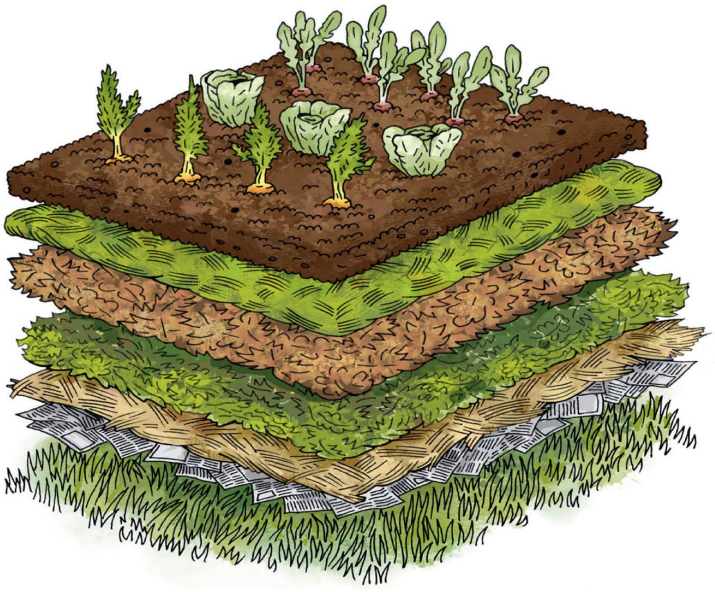

COOL
SPRINGS
PRESS

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# **INTRODUCTION:** *What is No-Dig Gardening?*

Ever since humans went from hunters and gathers to farmers, we've been digging in the soil. At first, humans simply dug small holes in the ground to plant seeds with little disturbance of the native soils. But as humans evolved and required more and more food, farming and gardening techniques evolved as well. From human-powered cultivation to animal-powered digging to machine-driven tilling, we've continued to increase our digging, turning, and tilling of soils to produce food, flowers, and herbs. This hasn't come without consequences though. Soil erosion and degradation due to modern farming practices are major problems around the world.

But tides have shifted and attitudes have changed. In agriculture, no-till farming has proven a more productive way to grow large-scale crops while reducing erosion. In gardening, a similar approach has evolved over the last fifty years, inspired by gardeners and small-scale farmers worldwide. Gardeners and scientists are discovering the intricate life in the soil and the important role it plays in growing plants. No-dig gardening preserves and enhances that soil life, leading to more productive gardens. But the advantages of no-dig gardening go beyond caring for soil. You'll learn more about these advantages in chapter 1.

This book is inspired by early no-dig pioneers and is dedicated to their work and the continuing work of so many other gardeners. While in university, I remember reading the classic *One-Straw Revolution* by Masanobu Fukuoka. This Japanese farmer discovered innovative ways to build the fertility of his land, such as growing daikon radishes and leaving them to decompose in the soil as a cover crop to break up compacted soils. In Australia, Esther Deans was starting her no-dig garden experiment with layers of newspaper, hay, straw, and compost because she had such heavy clay soil that traditional gardening was almost impossible. In the United States in the 1970s, Ruth Stout added to the body of no-dig knowledge with her deep-mulching techniques. She found simply by keeping a thick organic

mulch cover on the soil year-round, she could easily plant without much weeding, watering, or fertilizing required. This made for a productive garden with less work.

Fast-forward to modern no-dig practitioners, such as Charles Dowding in England with his compost-rich no-dig system. Australian permaculturist Morag Gamble uses various layering techniques in her beds. American Toby Hemenway offers interesting ways to plant no-dig beds, such as the polyculture technique. The methods of no-dig vary around the world. I'm highlighting some of the best in this book. Which methods you choose will depend on your location and situation.

*No-dig gardens are productive and beautiful. They help preserve the soil life essential to our survival.*

There are even variations on the traditional no-dig method that allow gardeners to grow where no garden has grown before. Straw bale gardening uses the organic matter in bales to grow a successful garden on walkways, driveways, and other impermeable surfaces. The Eastern European tradition of mound beds or *hügelkultur* is a great way to sequester carbon by burying

logs and growing gardens on top of the pile. Keyhole gardening, as championed by gardeners such as Texan Deb Tolman, is being used to feed the world. Keyhole beds are popular in rural areas of Africa, where residents utilize organic materials found around villages to build productive and healthy home vegetable gardens. The work of these and many other no-dig gardeners is reflected in this book.

Recognizing that many gardeners don't have room to build even a small no-dig bed, I've included information on container and indoor growing as well. You can use some of the same concepts inherent in no-dig gardening to grow healthy vegetables, flowers, and herbs in a container using compost-amended potting soils.

Most books start from a personal story, and this one is no exception. I started no-digging later in life. I was raised on my Italian grandfather's farm, and like most boys, I was enamored with tractors, trucks, plows, hay balers, and rakes. Our home garden was always tilled under in spring by my uncle with his tractor. It was just the way it was.

When I went to school to study horticulture, the benefits of tilling and digging were touted as necessary to grow plants well. It was only after school when I started researching various gardening methods, talking to other gardeners, experimenting in my own garden, and seeing demonstration beds that my thinking evolved to no-dig. While the benefits of less work and productive gardens were an enticement in those early days, now with global warming and the need to reduce carbon emissions at the forefront of many people's minds, no-dig has taken on an added importance.

I hope this book inspires you to try no-dig gardening. It's a simple way to lessen our impact on the planet while growing our own food and flowers. With clear and practical steps, this hard-working book will be a reference for you in your garden for years to come. Let's begin by digging in (no pun intended) to why no-dig gardening is so beneficial.

*Chapter 1*

# THE BENEFITS OF NO-DIG GARDENING

> *Among the many benefits of no-dig gardening is a more productive garden with less work.*

Interest in gardening continues to grow around the world. More and more people crave contact with the natural world and want to feel more in control of their lives.

Growing a garden is a simple way to produce some of your own food and flowers, reduce stress and anxiety, and feel more connected to the natural world. But as interest in gardening grows, there's also a desire to make gardening less time-consuming, more productive, and more Earth-friendly. That's why many gardeners are turning to the no-dig gardening method. No-dig gardening requires less work than traditional gardening practices, can be more productive, and helps sequester carbon, reducing global warming. No-dig gardening increases soil health and fertility, reduces weeding, watering, and fertilizing, and requires fewer outside inputs. Let's look at each of these benefits in more detail.

## The Soil Wins

One of the basic tenets of no-dig gardening is similar to a medical doctor's Hippocratic oath—"first, do no harm." The soil is teeming with seen and unseen life. It's estimated there are more bacteria, fungi, protozoa, and other creatures in one teaspoon (4.8 g) of soil than there are people on the planet! While it seems innocuous to dig or till your soil to create a garden, it actually is doing more harm than good. Digging and tilling destroys many of these microbes and the sensitive and intricate network of soil creatures, upsetting the balance of soil life underground. This destruction can lead to a temporary increase in release of nutrients for plants, but that effect soon diminishes. Not only is soil life destroyed, but organic matter (decaying plant and animal materials—more on this later in the book) is decomposed at a faster rate, leading to the release of more carbon into the atmosphere. Tilling and digging also upsets the soil structure. Soil in tilled gardens can eventually become more compacted, with fewer air and water spaces.

No-dig gardening helps preserve soil moisture and fertility and makes for better air and water flow. In a world where global warming is causing more intense storms with heavy rainfalls and high winds, no-dig beds are better prepared to withstand this onslaught. Organic matter in the soil is maintained and increased through no-dig practices. Organic matter is well known for improving the soil's water-holding capacity, opening up air and water drainage channels, and buffering the impact of heavy rains and drought. Conventional tilling only opens up the soil about 1 foot (30 cm) deep, and it sometimes creates a layer of impermeable soil called hardpan. These tilled gardens aren't able to withstand heavy downpours as easily, since the water can't penetrate deeply into the soil. No-dig beds foster the natural drainage patterns of the soil, allowing for deep penetration of water and less erosion. This also allows roots to grow deeper so plants can withstand drought better.

*No-dig gardening beds are more resilient to increased vagaries of the weather due to climate change, such as heavy rain storms, drought, and strong winds.*

*No-dig gardens help sequester carbon in the soil in the form of long-lived humus. Humus is highly broken-down organic matter that helps feed plants.*

No-dig gardening reduces wind erosion as well, using lots of organic mulch to protect the soil year-round. This organic material provides a physical barrier from drying winds during storms.

The microbial networks in healthy soils, such as mycorrhizae (fungal networks that have a symbiotic relationship with plant roots), are fostered by soil organic matter and thrive in no-dig beds. These network relationships also make nutrients more available to plants. Roots are also able to access nutrients in the soil easier due to the open structure, reducing the need for lots of additional fertilizers.

# No-Dig Helps the Planet

With concern about global warming and many people looking for ways to help, sequestering carbon in the soil has been touted as one of the solutions. As the planet and its soils warm, increased bacterial activity will release more carbon into the atmosphere. No-dig gardening is a simple yet impactful way to help. By not turning the soil, we're slowing down the rate of soil carbon decomposition. Also, no-dig gardening encourages the formation of humus (which I'll talk about in depth on page 25) that holds carbon in the soil. If you're looking for a way to reduce global warming, the simple act of no-dig gardening will help.

*One of the biggest benefits of no-dig gardening is not having to do the hard work of digging up a new garden bed.*

*No-dig garden beds make gardening on an impermeable surface or poor soil possible, since you build your own soil to form the bed.*

## Less Work for You

While all this talk of healthier soil and saving the planet is important, many times it's the practicality of no-dig gardening that is most attractive to gardeners. I like the fact that no-dig gardening is less work. No longer will you have to dig new garden beds, turn old beds each spring, or remove sod and weeds. But for some, this less-work ideal may seem counterintuitive, because don't tools like rototillers and tractors make for less back-breaking work in the garden? I won't lie to you. No-dig gardening does require some work, especially when starting out. Gathering and layering organic materials, compost, and raised bed materials (if you choose to use them) to build your no-dig beds will take time and effort. But the work is nothing like trying to dig a new garden bed. Plus, the beauty of no-dig gardening is once your beds are established, the workload decreases. This far outpaces any temporary benefits you get from digging and turning the soil.

Most gardeners till or turn the soil to prepare beds for planting and to kill weeds. Many gardeners have spent countless hours on hot summer days

sweating as they hoe or pull weeds. But many of the weeds we're battling germinate after the soil has been turned. There are literally thousands of weed seeds in your garden just waiting for the moment when there's enough warmth, water, and light to grow. By not turning the soil, we leave those weed seeds unable to germinate. No-dig works on perennial weeds too, smothering them with organic matter so they eventually die. If any weeds do appear—and you will get some—they will be easy to remove by hand because the soil is so light and filled with organic matter.

*Even gardeners with little room to grow can create no-dig garden beds. Since they are more productive than regular beds, you won't need many to produce plenty of food and flowers for your home.*

The soil in no-dig beds is easier to plant by hand. I often don't even use a trowel to plant. The soil is so friable and light that you can simply move the soil aside with your hands before tucking in seeds or transplants. This makes for quicker and easier spring planting and simpler succession

planting during the growing season. No-dig gardening creates an ecological balance in the soil, which fosters healthier plants and leads to fewer insect pest problems.

Add these benefits to the perks of increased water holding and nutrient availability, and the result is healthier soil. Less digging, weeding, watering, pest control, and fertilizing means less work.

## Lower Start-Up Costs

No-dig beds can be started very simply. By using organic materials you have on hand (more about these on page 33), you can create the layers needed to get the no-dig bed process going. Later in this book, I'll talk about areas of the world where no-dig beds are built with just native grasses, branches, animal manures, food scraps, and paper materials. Variations of no-dig beds can even be built on impermeable surfaces and compacted clay soils.

## Easier to Maintain

Inherent in no-dig gardening are raised beds. I will talk a lot about different types of raised beds in chapter 3. By adding layers of organic materials, you will obviously be raising up the area where you will be gardening. This could be the whole garden, or just individual free-standing or structured beds. If you just did raised-bed gardening without layering organic materials in the beds, you'd still reap many of the no-dig benefits. Raised beds define the planting space so you, animals, and others are less likely to walk on the planting beds. The less walking on beds, the less soil compaction, the better root growth, and the healthier the plants. Add that benefit to the light, fluffy nature of a no-dig soil, and you make a garden bed that's easy to plant and maintain.

*Build a no-dig garden bed that's elevated to reduce the need to bend and the amount of stress on your knees, back, and hips.*

Raised beds also allow you to concentrate your planting, watering, and fertilizing in a smaller space. This will lead to higher yields in your no-dig bed. You can say goodbye to the large garden and its demanding workload, unless you want to grow extra for friends, neighbors, family, and those in need. A few well-maintained raised beds may be enough to feed you and your family. Because the soil is so healthy, you can easily plant successive crops in the same bed without the need to turn the soil. Once established, you keep the no-dig bed healthy just by regularly adding more organic materials.

Hopefully by now you're convinced that no-dig gardening is worth a try. That's good, because you're holding a whole book on the subject! Let's dive in.

*Chapter 2*

# SOIL CONSIDERATIONS IN THE NO-DIG GARDEN

> *Soil is not just "dirt." It consists of weathered rock, topsoil, and organic matter.*

For most types of gardening, success starts with the soil. Soil is the soul of the garden, and caring for the soil is the first step to growing healthy plants. With no-dig gardening, the status of your existing soil will not matter as much as with in-ground gardening, because you'll be adding lots of organic materials that will break down and turn into healthy soil for your plants. But your native soil still matters, especially if you don't build deep beds.

Knowing the type of soil you have, its pH, and its water drainage capacity will enable you to alter your soil-building strategies for the plants you're growing. While no-dig will help a poorly drained soil better percolate water and a sandy soil hold more water, it's still good to know how well your native soil drains. This will tell you what plants to grow and how deep your no-dig bed should be. If you're trying to grow specialty plants, such as blueberries, you'll need to know the existing soil's pH and adjust it, if necessary, to suit those plants. Deep-rooted vegetables, herbs, and flowers —and certainly perennial plants—can reach down to the native soil beneath your no-dig bed, depending on its depth. While no-dig gardening is all about creating healthy soil from organic materials, knowing something about your native soil does help you grow better. So, before you go buying fertilizers, topsoil, and compost, let's talk about what soil is and how to enhance it.

Soil consists of broken rocks and minerals, living organisms, decaying organic materials, air, and water. Soil can be as deep as only a few inches to many feet. Amazingly enough, all life on our planet is dependent on this thin skin of soil. Soil is pretty important stuff.

The crushed rocks and minerals in the soil provide some of the nutrients plants need. However, nutrients need to be in a form that plant roots can use. The nutrients need an intermediary or bridge to those roots. That's where organic matter, soil microbes, water, and air come in.

Soil is built in horizons or layers. The top 6 to 12 inches (15 to 30 cm) create the topsoil layer. It consists of humus, decomposing organic matter, and broken-down bedrock. All three are important for your plants to grow well. This topsoil layer is most critical for plants. It is the stuff that sticks to your hands and gets them "dirty." Organic materials such as sticks, weeds, leaves, grass clippings, roots, dead soil creatures, and manure break down, forming soil humus and compost. It's generally recommended that your soil should contain 5 to 10 percent organic matter. This topsoil layer is relatively stable and is the one soil scientists measure when they test your soil. But soil goes deeper than the topsoil. The soil below the topsoil layer is called the subsoil. It also contains plant roots, microbes, water, and air. It is essential for larger, woody plants that need more nutrients and a way to anchor themselves. Depending on where you live, this layer can be very deep. For example, the deepest roots ever measured were from a fig tree in Africa that tunneled 400 feet (122 m) deep!

The reason all this soil talk is important is because conventional gardening and farming disturbs this delicate balance of organic matter and soil layers (or horizons). Tilling, digging, and turning the soil often destroys the soil life and disrupts the air and water pores. This leads to compacted, less fertile soil. It also increases the breakdown of the humus layer that is critical to plants' water and nutrient uptake. No-dig gardening leaves the layers intact while building up the humus and organic matter content necessary for our vegetables, fruits, flowers, and herbs to grow. This leads to better water and air flow, easier root penetration into native soils, better nutrient uptake, and healthier plants.

# Types of Soil

Before we start amending the soil, we first have to know its type. Determining your soil's type doesn't have to do with online dating or astrology. It's a simple process of checking your soil for the percentage of clay, silt, and sand. Knowing the makeup of the mineral parts of your soil helps determine its characteristics, including the soil's fertility, water drainage, and air pore spaces.

*As you can see in this laboratory full of soil samples, each soil has its own set of characteristics. Knowing if your soil is dominated by sand, clay, or silt will help you determine its fertility and drainage capacity.*

Some characteristics of your soil type are pretty obvious. Soils dominated by clay tend to be sticky when wet and crack when dried. These are generally hard to dig and work. When you rub the soil between your fingers, it feels slick and slimy. The reason for these traits is clay soils have the smallest particle size. This means the air and water spaces are small as well, so water drains slowly through clay soils. The small particle size also makes clay soils dense, so they compact easily. This contributes to clay

soils being slow to warm up in spring and clumpy when dug. When dry, the clay particles stick together easily in clumps, making the soil crack. But on the plus side, clay is the most fertile of the soil types, meaning it contains a lot of nutrients.

*Although it has good water-holding capacity, clay can be hard to work, especially when it's too wet or dry.*

Sandy soils are just the opposite of clay. They have the largest particle size, so air and water flow freely through these soils. When you rub sandy soil between your fingers, it feels gritty. Think of the beach in summer. I remember building sandcastles as a kid and always having to work hard to keep the water in the moat because it drained so fast. The large particle size and pore spaces mean sand is less dense and stays loose. It doesn't form clumps easily and warms up quickly in spring. Although sandy soils are easy to work, they're the least fertile of the soil types.

Silt's characteristics are somewhere between clay and sand. Its particles are not too big and not too small. It holds water but drains well. It warms up quicker than clay in spring, but not as fast as sandy soils. It holds more

nutrients than sand, but less than clay. Silt is the middle path in the soil world.

It’s unusual to find soils that are just clay, sand, or silt. Most soils are a mixture of these three soil particles. In a perfect soil world, the ideal soil is 40 percent clay, 40 percent sand, and 20 percent silt. This type of soil is often referred to as loam. Ahh, but perfection is hard to come by. Most gardeners have soils that are dominated by either clay or sand and have to work with what Mother Nature has to offer.

# Fun with Soil

## SIMPLE SOIL TESTS

For the soil nerds in the audience, here are some simple soil tests you can do to dive deeper into your soil type and really figure out the percentage of clay, silt, and sand. These are fun party tricks as well!

### Ribbon Test

This will give you a rough idea of the amount of clay and sand in your soil. Take a small handful of soil and remove the rocks, sticks, and roots. Wet the soil and roll it in your palm to form a ball. If you can't form a ball, the soil is at least 50 percent sand. If it forms a ball, squeeze it out between the pads of your thumb and index finger to form a ribbon. If it forms a ribbon, it has clay in it. Next, try to stand the ribbon upright. If your ribbon stands about 2 inches (5 cm) tall without naturally breaking off, the soil probably has somewhere between 25 and 50 percent clay. The taller the ribbon, the more clay is in your soil.

### Jar Test

This test is a little more precise and a lot of fun for impressing the in-laws, especially if they're science nerds too.

Take a sample of your garden soil from a number of places in the bed, digging down below the surface layer. Mix it up and take a 1-cup (227 g) sample. Let the sample dry and remove sticks, roots, stones, and other debris. Crush the soil with a mortar. Then, place the soil in the bottom of a quart (946 ml) glass jar. Fill the jar with 2 cups (475 ml) of water and add 1 teaspoon (8 g) of borax to help the soil particles separate. Shake the jar vigorously for 5 minutes and wait.

*You can determine the percentage of clay you have in your soil by making a ribbon from a handful of soil and measuring its length.*

Over time, the soil solution will settle to the bottom in different layers. The first particles to settle will be the largest—the sand. A few hours later, the silt layer will form. Finally, the clay layer will settle on top in a few days. By measuring the depth of these three different layers in relation to each other, you'll know, roughly, how much sand, silt, and clay you have in your soil. For example, say you have a 1-inch (2.5 cm) thick layer of soil in your jar. If the sand layer is ½-inch (1 cm) thick, the silt layer is ¼-inch (6 mm) thick, and the clay layer is ¼-inch (6 mm) thick, then you have 50 percent sand, 25 percent silt, and 25 percent clay soil. If you reference the soil pyramid on page 20, it will tell you this type of soil is called sandy clay loam.

## HOLE DRAINAGE TEST

To test how well your soil drains, dig a 1-foot (30 cm) wide and deep hole and fill it with water. If it drains within 30 minutes, it's too well drained, indicating your soil will probably dry out quickly. If it takes up to 4 hours to drain, that's fine. If it takes longer than 4 hours, you likely have an issue with poor drainage.

## HARDPAN METAL ROD TEST

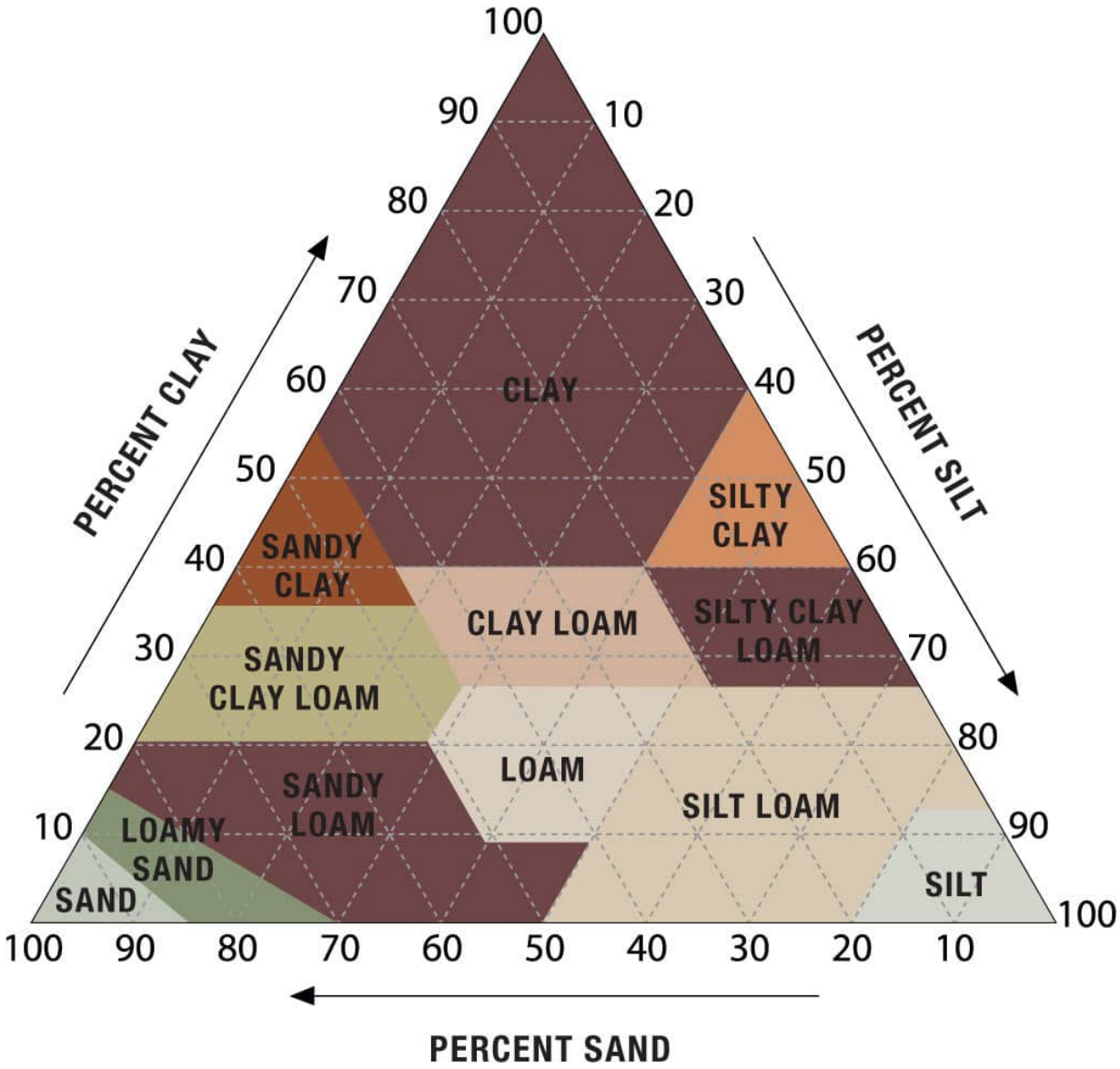
To check if your soil has a hardpan layer, water the garden area well. Take a ½-inch (12 mm) diameter metal rod and push it down into the garden soil. If you can go 8 inches (20 cm) with little resistance, you're golden. If you keep hitting a rock when pushing the rod in different places, don't fret. Just move over a few feet and try again.

If you can’t insert the rod at least 8 inches (20 cm), move the bed to a site with a thicker layer of topsoil. If that’s not possible, build a tall raised bed on top of the soil and work from there. In chapter 3, I’ll talk about building your no-dig raised bed from scratch.

*The settled layers of sand, silt, and clay in the glass jar test show you the percentage of each type in your soil.*

*Digging a drainage hole is a good way to determine how well water moves through your soil.*

Now, I know what you're thinking. *So how does the soil type relate to my no-dig garden? I'm not going to be digging the soil anyway*. The soil type will give you a starting point for knowing what the challenges may be in your no-dig garden. It will help you know if you need a rather deep bed because the native soil is poor or compacted, or if a shallower bed is best to take advantage of the fertility of the native soil. I'm certainly going to talk a lot about the organic matter component of the soil and how this remediates the extremes of soil types, but before you go to the solutions, let's learn more about other traits of your existing soil that can impact the success of your no-dig garden beds.




*Once you determine the percentages of each type of particle in your soil, you can determine its type using this soil pyramid.*

# Soil Drainage

How well your existing soil drains water is important when siting your no-dig garden. Soil water drainage can make or break a crop. Garlic is an easy crop to grow in temperate regions when planted in fall and harvested the following summer. The only time I've ever had a garlic crop fail is when I planted it on soil that didn't drain well. The cold, wet conditions in early spring rotted the cloves. Generally, you can improve poorly drained soil, or soil that drains too quickly, by adding organic matter to it to change the pore size and either encourage or discourage drainage. But it's also good to know the source of your drainage problem. It could be compacted soils that can be remedied with organic matter. It may be a physical object buried in your soil that needs to be removed (a large concrete slab, perhaps?). Sometimes you'll have an impervious hardpan layer of soil below the surface. This can stop water from freely draining, creating excessive wetness. A hardpan layer also can form because of man-made soil compaction (repeatedly running a tractor or heavy vehicles over the soil), or it can be a natural phenomenon.

## A Word about Urban Soils

For those gardeners living in cities and small towns, soil contamination is a possible issue. In areas of the world where people have lived for centuries, whole civilizations can be buried under your feet. Your garden may have been the site of past homes, businesses, and industries that left their mark in the form of debris and soil contaminants. The contamination may take the form of physical objects buried in the soil, such as concrete, pottery, wood, or metal. Trying to excavate these materials may be a bigger job than is realistic and, if you don't own the land, may not be possible.

Another source of contamination is chemicals that were used on the site in the past. While your site is now used for a private residence (or perhaps a community garden), in the past it may have been an old road, business, or industrial site. The soil may contain remnants of chemicals and toxins that are harmful to plants and people.

While all this talk of contamination might seem scary, there are simple solutions. There are ways to remediate the soil, such as digging and removing the soil and bringing in fresh topsoil. However, the simplest solution is to build a raised bed no-dig garden. Those physical objects and contaminants are buried, so leave them there. Build your garden on top of the existing ground by using healthy soil to fill your raised beds and no-dig techniques that allow your vegetables, herbs, and flowers to flourish without the risk of contact with toxins. Simply lay landscape fabric over the area where you'll be building your no-dig garden—it will act as a physical barrier between your healthy soil and the contaminated soil. Then follow the guidelines on building beds on compacted soil in chapter 3.

*Urban soils are unique. Because of their history of usage, you never know what might be buried under the top layer of soil. In these instances, using raised beds is a great option.*

*Even contaminated urban soils can be rejuvenated with a combination of raised beds, compost, and no-dig gardening techniques.*

## Soil pH

Another factor you should know about your soil is the pH. Without getting into the chemistry, pH measures the sweetness (alkalinity) or sourness (acidity) of your soil. pH is measured on a scale of 1 to 14. One is very acidic and 14 very alkaline. Most soils fall in the pH range of 5 to 9.

*Certain plants, such as blueberries, rhododendrons, and camellias, need a low pH or acidic soil to thrive.*

The pH of your native soil will be different based on where you live and the parent rock material in the soil. Generally, in areas of the world with humid, rainy conditions, the soils tend to be more acidic. In drier areas of the world with less rainfall, the soils tend to be more alkaline. But there are always exceptions to this rule.

The pH is important because certain plants have specific alkalinity and acidity needs. If you have a high pH soil, it may be difficult to grow blueberries, which like an acid soil (below 5 pH). If you have a low pH soil, asparagus, which grows well in a neutral to slight alkaline soil (around 7 pH), may not thrive. Adding lime (to raise the pH) or sulfur (to lower the pH) are the usual solutions to adjust the pH of your soil, keeping it in the general 6 to 7 range most plants like.

I’m not spending much time on soil pH, other than making you aware of its importance. The reason is if you follow the no-dig gardening techniques and are adding organic matter regularly, the pH will rarely get out of whack. Organic matter will buffer fluctuations in soil pH. Usually you can tell your pH is fine because all your plants are growing happily, but it is something to consider if your plants aren’t growing well.

## Plant Nutrients

You’ll find lots of talk in the gardening world about making sure you add plant nutrients to the soil so your plants grow strong. The three major nutrients often recommended are nitrogen, phosphorous, and potassium. These, along with a host of minor nutrients, such as calcium and magnesium, are certainly important for plant health. But approaching your plants’ health by just looking at these individual nutrients is like assessing your body’s health just by the amount of proteins, fats, and carbohydrates you eat.

Plants and soil—like bodies—are holistic, and should be thought of in this way when deciding to add fertilizers. If you build a no-dig garden bed correctly and maintain it well with annual additions of compost and organic materials, adding extra individual fertilizers shouldn’t be necessary.

That being said, there may be occasions when an addition of some organic fertilizer, such as compost tea or fish emulsion, may be necessary for struggling young plants in new, no-dig beds. However, while fertilizers might be handy to have, their indiscriminate use isn’t advised.

## Organic Matter

Soil type, pH, nutrients, and drainage are important topics. But the real focus of the no-dig garden should be the soil’s organic matter. Organic matter is any plant or animal material that was once alive and is now in one of various stages of decomposition. In the soil, organic matter can be classified as living materials, partially decomposed materials, and well-decomposed materials.

*While compost isn't necessarily high in individual plant nutrients, adding a layer of compost to the surface of your no-dig garden each season provides many benefits.*

*Healthy soil contains humus, which is long-lived in the soil and helps with water retention, drainage, and nutrient uptake.*

## What Organic Matter Can Do for You

Organic matter is the magic elixir that makes every soil better. Oh, organic matter, how do I love thee? Let me count the ways ….

1. Organic matter increases nutrient uptake of plants, increasing yields.
2. It helps build good soil structure, which allows plant roots to penetrate deeply into the soil and water and air to flow freely.
3. It slows the movement of water in the garden so more water can penetrate into the soil and not run off.
4. It helps mitigate the effects of climate change by holding the soil in place and preventing erosion. The decomposing plant materials act as a barrier to buffer the impact of rain drops and wind on the soil.
5. Organic matter, in the form of humus, also sequesters carbon to reduce global warming.
6. Organic matter helps keep the soil pH in the neutral range where most vegetables, herbs, and flowers grow best.
7. Organic matter helps keep the soil in good physical health. It opens soil pores, which leads to less compacted soils.

As you can see, organic matter is pretty special stuff.

*A healthy soil has a mix of fresh, partially broken down, and totally decomposed organic materials.*

- Living materials include soil microorganisms, bacteria, fungi, protozoa, earthworms, and other creatures that feed on organic materials.

- Partially decomposed materials include organic matter such as grass clippings, hay, straw, wood chips, animal manures, and compost that are in the process of breaking down. (I talk about different sources of organic matter and their benefits in chapter 3).
- Well-decomposed materials include organic matter that has finished breaking down. This matter is often called humus.

All these forms of organic matter are important for soil health, and you should have some of each in your soil. While organic matter is a small percentage of the actual soil, it's perhaps the most important part. If the soil is the soul of the garden, organic matter is the heart of the soil.

Plants need nutrients to grow well, but they also need organic matter. An agricultural study in Michigan found for every 1 percent increase in the soil's organic matter level, there was a corresponding 12 percent increase in yields. While there is a lot of science behind how those nutrients are taken up and used by plants, the bottom line is organic matter is at the center of plant nutrition.

*No-dig gardening encourages earthworms to turn the soil for you. They create air and water passages critical for healthy plant growth.*

As I mentioned, organic matter that has broken down completely is called humus. Humus is high in carbon, very stable in the soil, and complex. It can last more than 100 years in your soil! Humus is composed of very small soil particles that attach themselves to other soil particles. Soils with abundant organic matter are high in humus. Humus affects the biological, physical, and chemical properties of soil. Humus has the ability to attract, hold, and release nutrients in the soil for plant roots to use. Humus also can hold onto nutrients so they don't leach into the subsoil where plants can't access them.

Organic matter also supports the biology of the soil by feeding the soil microorganisms, allowing the diversity of bacteria, fungi, protozoa, algae, and other creatures to flourish. These microorganisms help break down nutrients into forms plants can use. So, more organic matter in the soil means more diversity of microorganisms and more nutrients available for plants. Also, a plethora of soil microorganisms keep any harmful, disease-causing soil microbes from running rampant through your garden.

Organic matter actually helps with contaminated soils too. It binds pesticides and toxins in the soil so they don't adversely affect plant roots or leach out into waterways. It also helps foster the soil microorganisms that can detoxify some of these chemicals. Much of the good soil health that we strive for in no-dig gardening is encouraged by adding organic materials to increase the soil's organic matter.

Now you know where soil comes from, its constituents, and the role organic matter plays. You also know how a no-dig gardening system has all the keys to making our soil the healthiest and most productive possible. Let's put it all together and build a no-dig garden.

*Soil that's high in organic matter supports a diversity of soil life and has an excellent moisture retaining capacity.*

## Biochar

Black carbon or biochar has received lots of press recently as a potential soil additive to increase nutrient uptake, support soil biological activity, and sequester carbon to combat global warming. Many soils around the world have biochar or charcoal in them from centuries of natural and man-made fires and cooking. These biochar-laden soils were first noticed in the Amazon, where certain soils were darker than others and found to be more productive. These dark-black soils had high levels of charcoal in them.

Upon investigation, these black soils were found to help retain water and nutrients and increase biological activity in the soil. Farms are experimenting with biochar soil additives for these reasons and also to help mitigate carbon release into the atmosphere. Biochar is 70 percent carbon and very stable, holding the carbon in the soil for hundreds of years.

*Biochar is carbon-rich charcoal in the soil that aids in water and nutrient retention. It also sequesters carbon for long periods of time, helping to mitigate global warming.*

Research on using biochar is ongoing. Much of the research has taken place on agricultural soils, so the results may not hold true for small, home garden soils. There

are also a few caveats to remember. Biochar is very alkaline, so it can raise the pH in your soils. Making your own biochar is a sophisticated process. It isn't easily done at home. For a no-dig gardener, it would be better to take the excess woody materials—such as logs, branches, and trunks—in your yard and use them in the soil as an additive instead of trying to make biochar out of them. They can be chipped and added to your beds to slowly break down, or they can be buried and planted upon using the hügelkultur technique I describe in chapter 6.

*Chapter 3*

# BUILDING A NO-DIG GARDEN FROM SCRATCH

> *No-dig gardening techniques are used around the world to grow healthier and more productive gardens with less work.*

The modern origins of no-dig stretch back to the 1970s and 1980s. In places such as the United States, Australia, Japan, and England, gardeners started questioning the conventional wisdom of tilling, plowing, or digging the soil in order to grow a garden. Since then, many variations of no-dig gardening have cropped up under different names, including lasagna gardening and sheet composting.

What these garden types all have in common is the desire not to disrupt the soil's structure and life by digging or tilling. Also, these techniques promote soil fertility through the addition of compost and/or organic materials. If you're just starting out with no-dig gardening, it can get confusing and unnecessarily complex when you search the internet for ways to build the beds. For that reason, I decided to focus on a few different methods that offer alternatives based on where you live, the materials you have on hand, and your interest in a quick and dirty approach or the full-blown technique. Certainly there are plenty of variations to the examples I give in this book, but I find these techniques to be the best place to start.

## Siting the Garden

One thing all no-dig gardening methods have in common is the need for the bed/garden to be located in full sun. This is essential for growing the widest variety of fruiting vegetables and sun-loving flowers, such as tomatoes, peppers, zinnias, and cosmos. But if you only have sun on your site for half the day, you can still use the no-dig technique. You'll just have to limit what you grow to shade-tolerant vegetables such as root crops and leafy greens, and shade-loving flowers such as impatiens and begonias.

As I mentioned in the soil drainage section on page 20, ideally your site will not drain water too fast or be flooded for long periods during the growing season. I'd add that the best location for any garden is close to your house and near a water source. Also, pathways should be wide enough so you can easily move materials in and out of the garden. Once you've found the right site, then it's time to start building.

## Raise It Up

Regardless of which of the following techniques you use, no-dig garden beds are raised above ground level. These beds are formed in a few different ways.

*Some vegetables that grow well in part shade include root crops and leafy greens.*

First, you can build a freestanding no-dig garden bed. With no structure framing them, the big advantage here is the ability to easily change the design each year to suit your needs and whimsy. The initial set-up cost is minimal, and there’s no need for building or carpentry skills.

*Free-standing raised beds are more work each year to re-form, but they give you the freedom to change your bed designs and sizes.*

A second method is to build a frame for your no-dig planting bed. Use rot-resistant boards (avoid chemically treated ones), recycled composite wood, plastic wood, cement blocks, bricks, logs, or stones to outline and frame the bed. This frame will keep all the materials in place as you build your no-dig bed layers. It also helps stop weeds from migrating from the pathways into the bed. A structure, whether formal or informal, helps define the garden, so it's less likely visitors will accidentally walk on the planting bed and compact soil. Plus, it can last a long time. See page 41 for a simple step-by-step plan for building a wooden bed frame.

Let's look first at options for building free-standing no-dig garden beds.

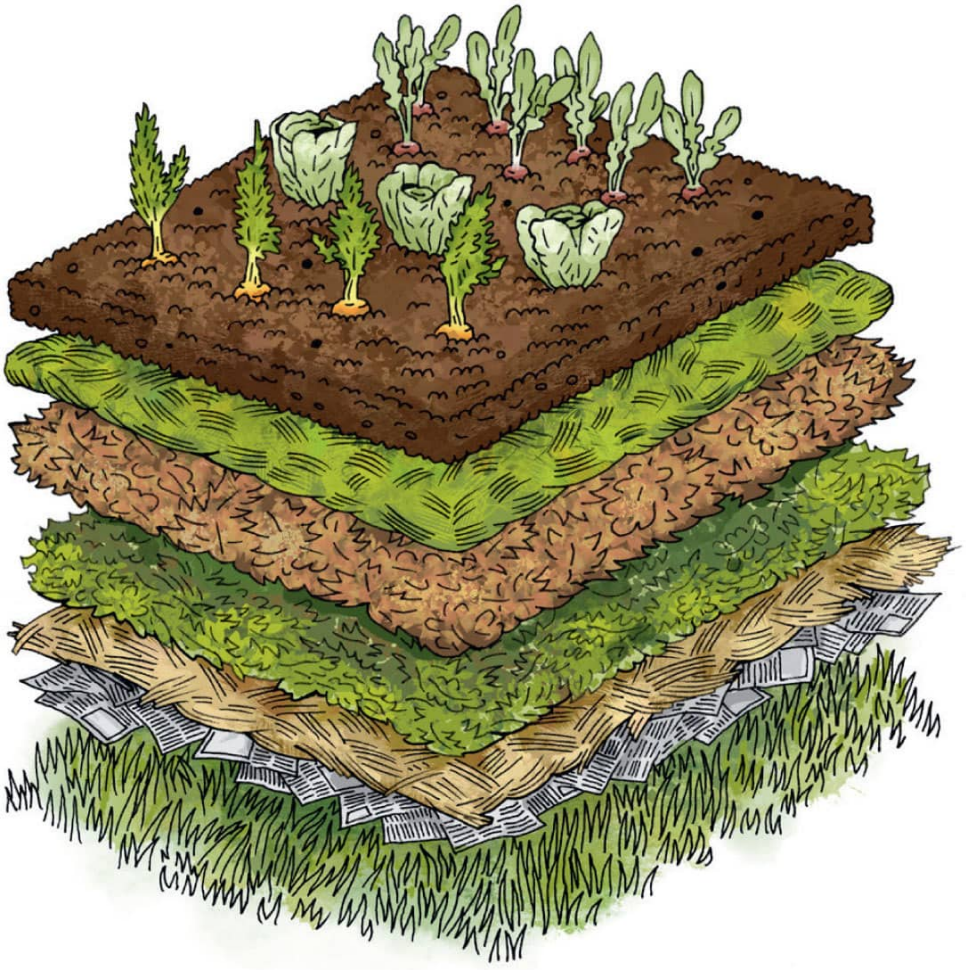
# Free-Standing No-Dig Garden Beds: Three Methods

There are three versions of no-dig garden bed construction I'd like to highlight here: multi-layered, all compost, and deep mulching. Each is championed by the expert gardeners from around the globe I mentioned in the book's introduction. The techniques vary on the amount of compost and other organic materials they use and the way the beds are built. Choose whichever one resonates with your gardening situation and your access to bed-building materials.

## MULTI-LAYERED NO-DIG METHOD

Layering organic materials in the bed is probably the most popular no-dig method. Many gardeners follow the permaculture philosophy of observing and mimicking natural patterns to garden in balance with nature. Adding layers of organic materials to the garden—similar to the natural layers formed by leaf drop and plant and animal wastes—fits right in with this philosophy. There are many recipes for no-dig gardening in the permaculture world, and layering organic materials certainly isn't limited to those practicing permaculture.

*You can use a variety of organic materials in your layered no-dig bed based on what's available in your area.*



*Layering a no-dig garden bed is like building a compost pile in your planting bed. Alternating layers of brown and green materials break down into humus-rich compost.*

One common version of this method involves constructing your no-dig beds like a compost pile. However, there are a few key differences between layering in compost piles and layering in no-dig beds. In the compost pile, you want to be more exact about the ratio of nitrogen (green) and carbon (brown) materials added to the pile (more about these layering materials on page 33), as well as the moisture content. You also want the compost pile to heat up, so it is often turned and dug to aerate and stimulate microbes. In a no-dig bed, alternating green and brown materials is still a good idea, but you don't have to be as exact with the ratios. Also, the bed is open to the elements and is built to naturally drain excess moisture. In no-dig beds, we often add finished compost as a layer and/or on top, and we never turn the bed. The organic materials beneath eventually decompose into useable

compost that your plants will love. It just may not be as quick or efficient as a well-constructed compost pile.

## Layering Your No-Dig Bed

1. Site your garden in the appropriate place for sun, water drainage, and convenience. Decide on using structured raised beds or freestanding ones and which materials you will use for a structured bed if that's the option you choose.
2. Cut the grass or weeds in that area.
3. Gather newspaper with black or colored ink. Avoid using glossy newsprint since it may contain heavy chemicals that can leach into the soil. For heavily weeded areas, consider using cardboard instead of newspaper. It's slower to break down but better at stopping tough perennial weeds. Remove any tape, plastic, and staples from the cardboard.
4. Wet the newspaper and lay 4 to 6 layers down, overlapping the edges where the beds will be located. The newspaper will kill grass and weeds, hold moisture, and break down quickly, allowing plant roots access to the underlying soil. A single layer of cardboard will take longer to break down.
5. Add a 3- to 4-inch (7.5 to 10 cm) thick layer of green, or high nitrogen, organic materials such as fresh grass clippings, seaweed, kitchen scrap veggies, or fresh weeds without seed heads or roots. See the chart on page 36 for more nitrogen (green) layer options.
6. Add a 1- to 2-inch (2.5 to 5 cm) thick layer of composted manure or compost.
7. Add a 3- to 4-inch (7.5 to 10 cm) thick layer of carbon (brown) material such as straw, chopped leaves, shredded paper, sawdust, or hay. See the chart on page 36 for more carbon layer options.
8. Continue alternating layers of green materials, compost, and brown materials until you've achieved the height you like or the framed bed is filled. Water well.
9. As the bed settles over time, you may have to add more compost or layers to build it back up.

*Lay down newspaper on top of the area to kill the grass and weeds beneath the layers of organic matter.*

*Once completed, a layered no-dig garden bed may be tall, but it will shrink and settle over time as the materials decompose. Here, straw was used to mulch the paths between freestanding no-dig beds.*

This layering technique works great if you have an abundance of organic materials, such as hay, straw, old leaves, seaweed, and grass clippings (see materials chart, page 36). It doesn't require a large dose of finished compost to get started. To maintain the bed, simply add a 2-inch (5 cm) thick compost layer and a 3-inch (7.5 cm) thick hay, straw, or chopped leaf layer after every cropping season.

If you build this bed in the fall in a cold-winter climate, the constructed pile will slowly decompose until spring. It will have shrunk by then, and the organic materials will be broken down enough to plant directly into the bed. If you build the bed in the spring in a cold climate or are gardening year-round in a warmer climate, add a thicker final layer of compost on top to be able to plant immediately. The compost will feed the seedlings while the rest of the materials decompose.

## Different Organic Materials for Building Your Beds

The great part about building a layered no-dig garden is that you can make the layers with materials commonly found around your yard. While you can use green (high in nitrogen) and brown (high in carbon) layers of organic materials to build a no-dig bed, you may choose to maintain the fertility of your bed, once constructed, by simply adding compost each growing cycle.

You certainly can purchase compost locally to add to your garden, but it's not that hard to make your own. The materials you need to make compost piles or layers in the no-dig bed are also all around you. You just need to identify what they are, where to find them, and how to use them. In forested areas, chopped leaves are a good resource. Near the ocean, you can use seaweed to make compost. In prairies or Mediterranean areas, harvested wild grasses are great additions to a compost pile or no-dig layer. In suburban and urban areas, you may have to rely on leaves collected from your neighbor's yard, compost brought into the city, or food or household waste from your home. You can even make small amounts of compost by farming worms (vermicomposting) indoors or in a small yard. See page 68 for more on making compost.

In most areas of the globe, organic materials are available and often are just considered waste material. They can be used to create the finished compost your plants need to thrive, or they can be used to create layers in your no-dig garden bed.

## ALL-COMPOST NO-DIG METHOD

The second, and probably the simplest method of free-standing raised bed, no-dig gardening, is to fill the bed area with compost and/or topsoil only. This method requires a good amount of finished compost and soil to start, especially if you're filling multiple large beds.

*Organic materials abound around the world, even in dry areas. Simply look around your area for different types of organic materials to build and feed your no-dig beds.*

*One of the best organic materials to use in a no-dig bed is seaweed. It's loaded with micronutrients and is abundant along the coast.*

When starting your all-compost no-dig garden from scratch, mow down the area. If it's just grass without many perennial weeds, simply add a 6-

inch (15 cm) thick layer of compost and soil on top. If it’s a weedy site, add a layer of moistened cardboard or newspaper over the ground and cover it with the thick layer of compost and soil. You can build a framed raised bed to hold the compost, or use the free-standing raised bed method. Some gardeners like to lay cardboard, compost, and soil over the whole area with free-standing beds and wood chip–mulched paths. This helps water drain better in the paths and thwarts weeds from creeping into the beds from the pathways.

The cardboard breaks down over time, killing the underlying grass and smothering the weeds. With this method, you can plant immediately in the beds. A few hard-to-kill weeds may pop through the compost and soil over time, but they are easy to remove. However, if you use cardboard under the 6 inches (15 cm) of soil, you will be limited the first year to growing shallow-rooted greens, bush beans, radishes, onions, small herbs, and flowers, as the cardboard will take time to decompose. If you wish to grow thicker-rooted plants, add a thicker layer of compost and soil. If you use newspaper as the bottom layer, it will break down faster than cardboard, so you can plant any vegetable.

*The all-compost no-dig bed is probably the easiest to build. Simply mow or cover the existing soil with wet newspaper or cardboard, pile compost on top, and plant.*

The combination of adding compost every year and not compacting the soil with foot traffic or machinery helps preserve the soil structure so air and water flow freely through the soil, not puddling in the beds or paths. It also provides the food soil microbes need to release the nutrients for plant growth.

The one downside of this technique is the need for lots of compost and topsoil to fill the beds, which can become expensive. The two options are to make your own compost or buy finished compost. When making your own compost, it's important to build the piles so they heat up properly. Hot piles will kill many weed seeds and diseases (see page 68 for more on making your own compost).

Using only compost and soil creates a clean-looking garden. It's especially helpful in places with wet climates, such as the British Isles, western Canada, the United States Pacific Northwest, and parts of Japan,

where slugs and snails thrive and enjoy hiding in the fresh organic materials used in the multi-layer method of no-dig gardening.

# ORGANIC MATERIALS CHART

Check out this chart for some of the types of organic materials available and tips on using them. After each ingredient I have a (C) or (N) to let you know whether the material is primarily for adding carbon or nitrogen. This is just the tip of the iceberg of organic materials you can add to a no-dig bed or a compost pile.

*A key to using organic materials wisely in your no-dig bed is to understand their characteristics. Some break down quickly, like these grass clippings, while others break down slowly.*

| ORGANIC MATERIALS | |
|---|---|
| **Compost (N)** | Compost is considered a nitrogen source and a great additive to layer into your no-dig bed. It also helps activate a new compost pile when added to it. When selecting commercial compost, ask what materials were used to make it. Make sure it's fully decomposed and has not been weathered, which leads to nutrients leaching out. |
| **Leaves (C)** | Since they're slow to break down, it's best to chop leaves before using. Consider collecting your neighbor's leaves or picking up their bagged leaves to use. |

| | |
|---|---|
| **Pine Needles (C)** | Slow to break down due to a waxy substance on the needles, these are best chopped or shredded before using. |
| **Grass Clippings (N/C)** | Fresh clippings are a great source of nitrogen, but they break down fast and can get moldy if you add too many. Brown, dead clippings can be treated like hay or straw. Avoid using grass clippings from lawns treated with herbicides. |
| **Kitchen Refuse (N)** | While you can add most of the kitchen scraps from your home as a no-dig bed layer, it's best to avoid adding meats, bones, and oily foods. Mix wet, fresh kitchen scraps with dry materials such as chopped leaves and straw into a layer. Useable kitchen refuse includes fruit and vegetable scraps; crushed eggshells; coffee grounds and filters; paper towels, napkins, and plates made from non-chemical-treated paper; and tea leaves and tea bags made from natural fibers. |
| **House Refuse (C)** | There are other carbon-rich materials around your home that can be used in a no-dig layered bed or tossed into the compost pile. Shredded paper from a copier, junk mail with the plastic windows and glossy pieces removed, cardboard delivery boxes with tape and plastic removed, cardboard cereal boxes, paper shopping bags, paper towel and toilet paper rolls, dryer lint from natural fibers, cotton balls, and pet fur. The list goes on and on! These are best added in a layer with other carbon-rich materials such as hay or chopped leaves. |
| **Garden Refuse (N)** | Spent garden plants are a great source of organic material. You can add anything not insect- or disease-laden. Weeds are fine to add as long as they don't have a spreading root system and the seed heads are removed. Another way to use plants and weeds in the garden is by using the chop and drop method described on page 69. |
| **Hay/Straw (C)** | Hay and straw break down slowly. Hay is usually easier to find and cheaper than straw, but hay can have weed and grass seeds, while straw does not. You can also plant right in hay or straw bales; I talk about that method on page 73. |
| **Peat Moss and Coir (C)** | While peat moss and coconut coir are usually reserved for potting soils (I talk more about these materials in chapter 7), you also can use them as a carbon layer in a no-dig garden bed or compost pile. Peat moss will shed water, while coir will more readily absorb it. You can even use old potting soil as a layer in your no-dig bed. |
| **Animal Manure (N)** | You don't have to live near cow or horse farms to get animal manure for your garden. Chickens, rabbits, and goats may all be found in towns and city lots, providing free and plentiful manure. Avoid manures from dogs and cats as they may contain pathogens that infect humans. Use manures that have been dehydrated or fully decomposed to build your no-dig layers. |
| **Bio-Solids** | Some municipalities offer composted bio-solids from their wastewater |

| | |
|---|---|
| **(N)** | treatment plants for sale to the public. These bio-solids are high in nitrogen and should be completely composted. However, they cannot be used in certified organic agriculture, so take care before deciding whether or not to use them in your no-dig garden. |
| **Organic Fertilizers (N)** | Although your no-dig bed should make its own fertilizer for your plants, adding a little organic fertilizer—such as blood meal, kelp meal, alfalfa meal, or a complete organic granular fertilizer—will provide additional nutrients. Apply a thin layer if you wish. |
| **Seaweed (N)** | Seaweed is loaded with micronutrients and nitrogen. Collect washed-up seaweed from beaches where doing so is legal. Select mid-beach seaweed that is drier and lighter to carry. Wash the seaweed to remove the salt. Select small-leaved seaweeds or chop up large pieces so they break down quicker. |
| **Woody Branches, Twigs, Wood Chips, and Sawdust (C)** | These are best chopped into pieces before adding to the bed. They are high in carbon and slow to break down. You can also use branches and logs to create a hügelkultur mound as described on page 78. |
| **Newspaper and Cardboard (C)** | Use black and white newsprint paper. Colored pages are also fine as long as they aren't glossy. Shredding the paper speeds up decomposition. Cardboard is fine to use for weedy sites. Remove any tape, glossy paper, and staples from the cardboard first. Cardboard may take up to one year to completely decompose in most garden settings. |

## DEEP-MULCHING NO-DIG METHOD

The third method of no-dig gardening that I'd like to mention is deep mulching. Deep mulching takes the no-dig bed-building ideas and simplifies them even further. The best way to describe the deep-mulching no-dig technique is to tell the story of its modern founder, Ruth Stout.

In the 1970s, Ruth challenged the conventional wisdom of plowing her garden each spring as if she was a farmer. She noticed the soil sprouted an abundance of weeds after plowing, making lots of work for her all summer. Plus, she always seemed to have to wait for the farmer to come to plow, often missing golden opportunities in spring to sow plants and seeds. Ruth took matters into her own hands and started experimenting with no-dig

gardening. She dug shallow trenches, planted seeds and plants, and then mulched heavily around them to stop the weed growth. Ruth used a combination of old hay and leaves spread 8 inches (20 cm) thick. Once the vegetables and flowers were established, she added more mulch around the plants. Instead of adding layers of brown and green materials or even finished compost, she just mulched the whole garden with hay and leaves each year, never leaving the soil bare. She found the mulch slowly broke down into compost that fed the plants. In time, she stopped using manure, extra compost, lime, and fertilizers when planting.

*Deep mulching is layering hay, straw, and/or chopped leaves at least 8 inches (20 cm) deep all through the garden. Keeping the mulch on year-round smothers weeds, eventually breaking down into compost to feed the plants.*

*Hay mulch works for deep mulching even though it has weed seeds. The key is keeping the soil deeply mulched year-round to prevent any of those seeds from germinating.*

## My Lasagna Gardening Recipe

I like to cook, and I have my own version of making a no-dig bed, sometimes called a lasagna garden. My recipe is very simple. I have used it to build new beds and expand existing ones. I have to admit, one of the reasons I like no-dig gardening is because I'm lazy. I really would rather not dig, strip sod, cut weeds, or work too hard in my garden. This method kills the weeds and builds a bed with little work.

*In my version of the lasagna method, I like to keep the layers simple. I layer newspaper or cardboard, add hay, straw, or chopped leaves, and then put compost on top. Bellissimo!*

Unlike the multi-layered, no-dig raised bed, in my lasagna bed technique, I'm not too concerned with green and brown materials. I just layer newspaper or cardboard; top it with hay, straw, or chopped leaves; and then add a layer of compost, to create the bed. Here is my simple recipe.

After mowing down the area, I start layering moistened black and white or colored paper (as long as it's not glossy) or cardboard. I use cardboard on really weedy areas with tough-to-kill weeds such as burdock, brambles, and dandelions. I remove any tape, staples, or glossy paper from the cardboard before laying it down.

Next, I add a 6- to 8-inch (15 to 20 cm) layer of hay, straw, chopped leaves, or dead grass clippings. I top that off with a 2- to 4-inch (5 to 10 cm) layer of compost. That's it!

As with the multi-layered approach, the paper products and organic materials here smother the sod and weeds yet leave them in place to decompose. Earthworms and other soil creatures feed on the sod and organic materials, releasing vital nutrients for growing plants to absorb. The compost provides a cap so the organic materials don't blow away, and it helps with the decomposition of all the organic matter. It also provides a way to plant in the lasagna bed before all the other organic matter is fully decomposed.

In temperate climates, building a bed in late fall will more easily smother the grass and weeds since they aren't actively growing. You can plant directly into the bed in spring. If you build the bed in spring, or in an area with year-round gardening, use a thicker layer of compost on top to help smother the grass and weeds and allow your vegetables and flowers to get a good start. You can plant within a month or two of building the bed.

*When using the deep-mulching technique, you can simply plant potatoes by pushing aside the straw mulch, dropping the tubers on the soil surface, and returning the mulch to cover them. They grow and produce fine without even having to dig.*

To Ruth’s amazement—and the surprise of neighboring farmers—the plants grew great. Her workload was reduced to planting, thinning, occasionally spreading mulch, and harvesting vegetables. She kept a supply of hay and leaves around to bury any weeds that popped through. After a few years, Ruth started planting large-seeded crops, such as corn, peas, beans, and potatoes, on the soil surface, not even digging the soil. She then lightly mulched over them. The plants grew fine without disturbing the soil.

Unlike in raised beds where we try to never walk on the soil, Ruth stomped around her garden frequently. But because of the perennial mulch layer, the soil was insulated from compacting. Ruth said she never had problems with slugs and mice eating her plants, but that would be something to watch for, especially when gardening in cool, humid summer climates that slugs love. Weed seeds from the old hay weren’t a problem, because she kept a fresh layer of mulch on the garden year-round, smothering and preventing any weed seeds from germinating.

So, if you have an abundance of hay, straw, grasses, and leaves in your area, the deep mulching method may be worth a try. The key is to keep the soil permanently mulched. As the years go by, the humus layer from the decomposing organic materials will build without you having to make compost piles, buy compost, or add other fertilizers.

## Framed No-Dig Gardening Beds

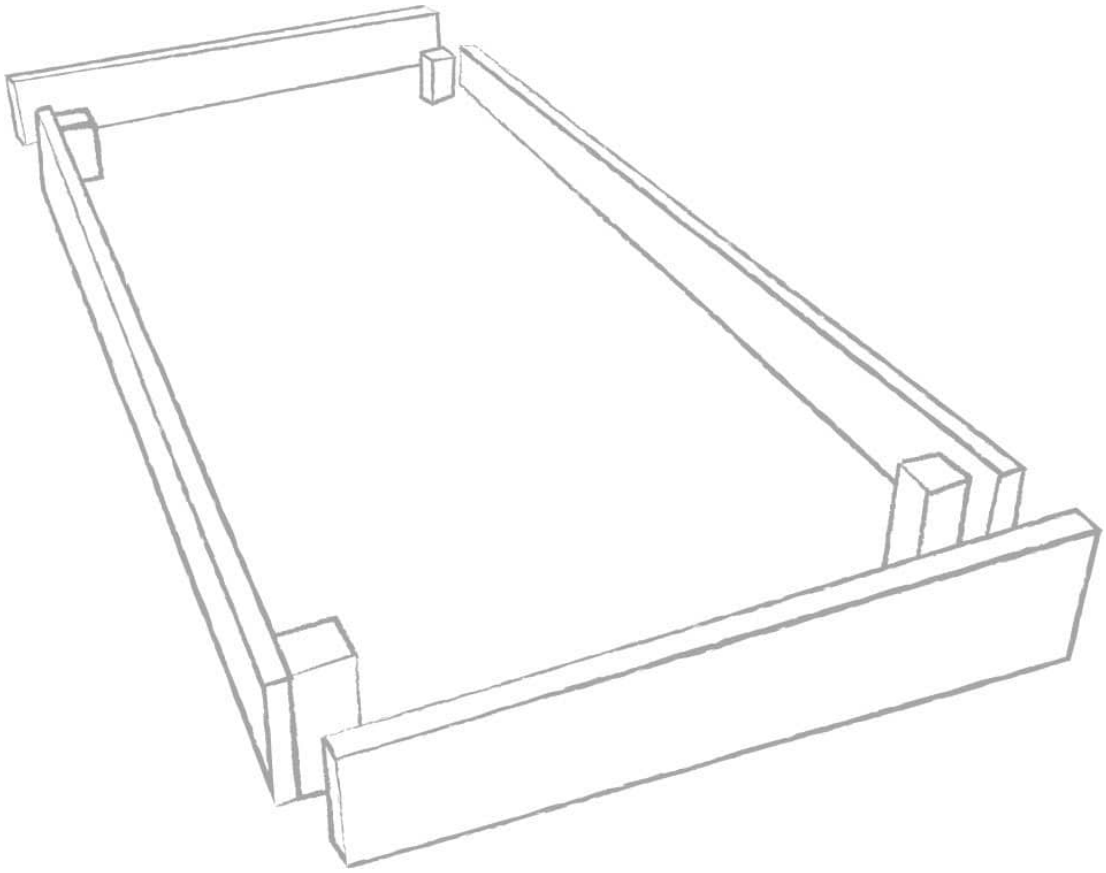
If you prefer to frame your no-dig beds rather than having them free-standing, there are many materials you can use for the job. Logs, stones, bricks, lumber, concrete blocks, and commercially made raised-bed kits are just a few of the options. If you choose wooden materials to build your raised-bed frames, select rot-resistant woods, such as cedar, redwood, and cypress. These woods can last up to twenty years before rotting. Soft woods, such as pine, will last only five to ten years. Recycled composite woods, plastic lumber, bricks, cement blocks, stones, and metal are also long-lasting options for constructing a raised bed. Metal beds placed in full sun can heat up the soil quickly, and sometimes too much. These beds should be placed in a part-shade location in warm areas or only used in cool-summer climates with heat-loving vegetables and flowers.

If you choose to use a frame for your no-dig bed, here’s how to build a simple, low-cost wooden framing structure.

You can also use stone, brick, or concrete blocks to build a raised bed frame. These materials are long-lasting and keep the soil cool and moist, so they're a good choice for hot, dry areas.

## INSTALLING A WOOD-FRAMED RAISED NO-DIG BED

*Mowing or cutting down the existing vegetation at the site of your no-dig garden helps weaken perennial weeds and adds nitrogen-rich clippings to the soil.*



*This illustration shows an easy plan for building a wood-framed raised bed.*

*Slip wooden boards into prefabricated metal raised bed corners when building your bed. The metal corners are great if you ever have to move the bed, since they are easy to slip right out if needed.*

1. **Mow It Down**—Mow or cut down the grass and weeds in the area. The reason you won't be stripping the sod or digging out weeds is there is a natural layer of rich soil just below the surface of most sites. By simply cutting the greenery back and covering the ground with compost and other organic materials, you will preserve this naturally fertile soil for your plants. Plus, remember, no-dig means less work and this is a great example of how to save your back.

2. **Choose Your Bed Design**—Beds can be square, rectangular, triangular, or even circular. It's all about your site and your preferred aesthetics. Beds should at least be 6 to 8 inches (15 to 20 cm) tall. To reduce bending, to block weeds from encroaching, and to keep small animals out of your beds, opt for beds that are 3 feet (0.9 m) tall (more on these elevated beds on page 47). No-dig raised beds can be as long as you like. Construct the garden so you'll never have to walk on the bed and compact the soil. This means making sure each bed is no wider than 3 or 4 feet (0.9 to 1.2 m). This distance allows you to reach into the center of each bed without having to step on the soil. Also, think of any garden accessories, such as a wheelbarrow or garden cart, you might want to use to move materials to the beds. Make the pathways wide enough to accommodate them.
3. **Construction**—If building the bed from wood, use wood with a 2-inch (5 cm) thickness, if available, for longest life. For beds longer than 6 feet (1.8 m), add a few bracing boards across the width. Use 2-inch by 2-inch (5 × 5 cm) or 4-inch by 4-inch (10 × 10 cm) posts in the corners to prevent the wood from bowing. Make the corner posts a little taller than the beds so you can cut the bottoms to a point. Pound these bottoms into the ground. You can also use metal corner brackets to secure the boards. These allow you to slip the wood planks into the corners without having to screw or nail boards together. It makes it easier to move the bed in the future without damaging the wood, and the metal helps keep the boards straight.
4. **Keeping Animals Out**—If tunneling groundhogs, gophers, and other rodents are a problem in your area, attach heavy-duty hardware cloth to the bottom of the wooden frame. Add hardware cloth up the sides of the bed as well if using stones, bricks, or cement blocks that have spaces where animals can slip through.
5. **Filling the Bed**—Which topsoil, compost, and organic materials you use to build the layers is a matter of preference. See the chart on page 36 for information on all the different choices. Some people prefer to fill their no-dig beds with finished compost, so they can load it into the bed and be ready to grow. Others use a mix of topsoil and compost. You also can use a variety of layers of organic materials with some

soil and compost to fill the bed. Some of these materials take time to decompose, but they result in wonderful, rich soil.

*Place hardware cloth on the bottom of no-dig beds on impermeable soils to prevent soil washing away and to keep critters out.*

## ADAPTING YOUR NO-DIG BED TO CONCRETE OR ROCKY SOIL

No-dig gardening works well when you have a base soil layer that's already loose and has some fertility and tilth to it. However, if you are in an urban

area trying to build a no-dig garden on rocky soil, gravely soil, compacted soil, contaminated soil, concrete, or asphalt, you'll need to make a few adjustments to your no-dig beds.

Here's the technique I recommend for building a no-dig garden on poor soil or concrete.

*One of the benefits of no-dig gardening is you're building the soil from scratch. It's a perfect way to garden on imperfect soils or even concrete.*

1. **Create a Raised Bed**—Unlike on normal soil where you can build a free-standing bed or a framed raised bed, when building a no-dig garden on an impermeable surface, always use a framed bed. The wood, stone, or blocks that outline the bed will keep the compost and organic materials in place better. You'll have to build the bed at least 1 foot (30 cm) tall to accommodate all the materials and compost.

2. **Create a Branch Layer**—When layering your no-dig bed, start with a 3- to 4-inch (7.5 to 10 cm) layer of thick branches and sticks directly on top of the ground as the bottom layer. This will create a place for water to drain more easily.
3. **Build the Bed Taller**—Use one of the previously mentioned layering techniques or simply add a deeper layer of compost. When layering, add some height to your bed, piling on an extra layer so you'll have more space for the roots to grow. Ideally, once decomposed, the soil layer should be 10 to 12 inches (25 to 50 cm) thick.
4. **Reduce Soil Erosion**—Because you're building on an impermeable surface, when the water moves through the raised bed, it may also wash away some of the compost. To reduce soil erosion, line the bottom of your bed with small-holed hardware cloth so the water can drain, but the soil is held in place.

## Adapting No-Dig to Sites with Perennial Weeds

When building a no-dig raised bed in a location with aggressive perennial weeds, you may need to make a few adjustments to deal with them. Perennial weeds, such as bindweed, quack grass, couch grass, and Canada thistle, can spread under mulches and through compost to pop up everywhere in your garden. In this case, you may have to resort to some extra measures.

Perennials weeds can be weakened and removed without using chemicals, but it will take time. On sites with few perennial weeds, building your no-dig bed with plenty of compost and organic material layers as described earlier may be enough. The deep layers will shade them out. Any that weakly emerge can be gently pulled, roots and all. For tougher weeds, add a layer of cardboard over the soil and pile compost and organic material layers on top. The cardboard will kill or weaken the weeds over time.

If you have lots of these tenacious weeds, you may also resort to using a plastic or poly tarp. Build free-standing beds as you would in a normal no-dig garden, and then cover the bed with a plastic or poly tarp. Seal it well

around the edges. You can leave the bed this way for a growing season to help weaken the weeds. However, since the bed has soil amended with compost layers, why not plant it too?

*Covering a weed-laden garden area with plastic or poly tarps is a great way to weaken perennial weeds while still planting and harvesting from the no-dig beds.*

To plant, cut small holes in the tarp and transplant tomato, squash, cucumber, melon, and other large vegetable seedlings. In most areas, grow heat-loving vegetables on the tarp, since it will heat up the soil in summer. The tarp will hold moisture in the soil, reducing the need to water too. As the no-dig layers break down, they release nutrients for the plants to use. The weed roots will be weakened from the lack of light. If any weeds pop through the holes, simply pull them out.

Depending on the type of weeds, you may need to use this method for a few growing seasons to get the weeds under control. At the end of the growing season, cut the vegetable plants at the soil line but do not disturb the soil. In the spring, remove the tarp and gently pull out any weeds and roots that are obvious, again trying not to disturb the soil layers too much.

Add more compost to the bed and re-cover with the tarp. Repeat as long as needed to remove the weeds.

*Building 3-foot (0.9 m) tall raised beds prevents weeds from invading. It also makes it easier on your back to garden and keeps small critters away.*

Another approach if you're building structured raised beds is to make the beds taller. Three-foot (0.9 m) tall raised beds will be so deep with soil and organic materials that weeds will rarely be able to reach the surface. It's more work at first, but it's a good long-term solution.

To build tall raised beds, either construct the sides all the way to the ground or build the beds on four posts. If running the sides to the ground, brace the inside of the bed with boards. Also, for most vegetables, you won't need all that planting space. Insert a false bottom of marine-grade plywood about 1 foot (30 cm) down from the top of the bed. Drill many

small drainage holes in the plywood and cover the bottom with hardware cloth so the compost doesn’t leach through. Use the same technique for a standing box bed. Brace the posts so the bed doesn’t wobble, and make sure the planting box is at least 8 inches (20 cm) deep. The deeper the box, the wider range of vegetables you can grow.

*Chapter 4*

# CONVERTING AN EXISTING GARDEN TO NO-DIG

> *While your existing garden may be growing okay, converting to a no-dig garden will give you healthier plants, and it's less work.*

As I highlighted in chapter 3, there are many ways to create a no-dig garden from scratch. It's great for starting a new flower or vegetable garden or expanding an existing one. But what if you've been gardening for a while and are interested in converting your old garden to no-dig?

Well, you can do it without starting all over again. You'll just have to assess the state of your present garden to decide the best route for going no-dig. Then apply the principles I've talked about for building your no-dig garden, with a few twists based on your garden situation. With some thought, and a little bit of work and patience, you can convert your garden to no-dig and be happily growing better flowers, vegetables, and herbs without as much work for years to come.

# The State of Your Existing Garden

Okay. So, this may be a bit of a gut check for your gardening ego, but it's time to honestly look at your existing garden and decide what's working and not working. Often this step will illuminate why you want to convert to no-dig. Granted, there are some gardeners who are happy with their present gardening practices and garden; they're just interested in experimenting with a less labor-intensive method such as no-dig. That's great! But I think the majority of gardeners interested in no-dig just aren't happy with their existing garden. Problems can range from lack of production to prolific weeds to insects and diseases or just too much work. Whatever the reason, the first step is to decide what's not working in your existing garden. And yes, in some cases, it might be best to start from scratch. Let's take a look at two of the most common problems gardeners face and talk about how no-dig gardening can help overcome them.

## POOR PRODUCTION

Perhaps your garden plants start off growing well but never really produce the flowers and vegetables you see other gardeners growing. It could be due to poor soil fertility, poor drainage, or an abundance of insects and diseases. But before you reach for the shovel to improve the drainage, use fertilizer to add more nutrients, or spray for pests, let's dive a little deeper into these issues.

If you garden in an area that has wet soils that puddle frequently after a rain, your problem may not be fertility at all, but water drainage. This could be due to growing your garden on an impermeable surface such as old compacted gravel, cement, or asphalt or on compacted soils. If you're growing on a site such as this, use the information I presented in chapter 3 to build up the existing garden bed or create a structured raised bed and increase the water drainage around the plants. However, if those solid materials aren't buried under your garden bed, then it may be an issue of compacted soil. Clay is one of the biggest contributors to compacted soil in a home garden. As I talked about in chapter 2, clay soil is great soil for many reasons, but it doesn't naturally drain well. Too much moisture in your soil means less oxygen and less biological life. That translates into roots that can't grow adequately to take up the nutrients your plants need.

*Weak or diseased plants may not be due to lack of fertilizer. They may have more to do with poor water drainage on compacted soils.*

*On compacted soil, simply create holes in the soil to help jump-start aeration, water flow, and soil remediation that continues as you add compost.*

So, for the existing home garden that struggles with compacted soils, and a gardener who doesn't want to build a taller bed, fork it. Before you convert your bed to no-dig, go through with a broad fork or iron fork after a rain. Gently push the fork into the soil and pull it out. Don't turn the soil, just puncture it. Fork down the whole bed. This will aerate the soil and help water drain without adversely affecting soil life. Then, start adding your no-dig organic materials on top of the existing soil. Another method is to grow a cover crop that breaks up clay in your garden. You'll learn more about using cover crops on page 53.

## Radish Cover Crop

Another way to help open up heavy clay soil without turning the soil is to grow a strong-rooted cover crop in fall. Some of the best crops for this job are radishes and daikon. Masanobu Fukuoka pioneered this method in Japan in the 1970s. Instead of regular garden radishes, he grew longer-rooted forage or oil radishes and daikon. These radishes form 8- to 14-inch (20 to 36 cm) roots, and they have the ability to grow in clay soils. Plant the whole bed with radish seeds in late summer. Instead of harvesting the radishes in fall, leave them. In cold-winter areas they will winter-kill. In mild areas they may overwinter and send up a flower stalk the following spring. Simply chop it down to keep the plants from reseeding and becoming weedy. Eventually, the plant will die. The deep taproot will decompose, leaving open spaces in the soil for air, water, and other plant roots. No tilling or digging required. However, there's one word of caution. A bed of rotting daikon can give off a sulfur smell that might be disagreeable for a while. If you want to keep your neighbors and family happy, start small, especially if you're gardening in close quarters.

*For clay soil, try growing forage radishes as a cover crop. Grow long-rooted radishes or daikons in the garden bed and don't harvest. The decomposing root systems open up channels in the soil for water and air.*

## Your No-Dig Transition Plan

Once you have a sense of what's not working in your garden beds, it's time to transition to no-dig. Here's a simple step-by-step plan to get you growing quickly.

1. **Working the Soil**—Loosen soil that is poorly drained with a broad or iron fork. Add more carbon-based organic materials on top of soils that are too well drained.
2. **Layering Weedy Beds**—For weedy beds, add cardboard on top of the area, flattening it first or removing and setting aside the existing soil for use in building layers. If you have wooden raised beds, lift them and tuck the cardboard underneath the wood frame so the weeds are less likely to migrate into the bed from the paths. If you will be planting soon, add a 6-inch (15 cm) thick layer of finished compost on top of the cardboard. Then drape a poly tarp on top of the compost. For the first year, make holes in the tarp and plant shallow-rooted vegetables through the holes. If you won't be planting for months, add layers of organic materials on top of the cardboard, as described in chapter 3, and top the bed with the poly tarp.
3. **Layering Non-Weedy Beds**—On beds that don't have lots of weeds, smooth out the existing soil layer and add 3 to 4 layers of wet newspaper on top of the existing soil. Then add 3- to 4-inch (7.5 to 10 cm) thick layers of organic materials such as chopped leaves, hay, and straw, alternating with 1- to 2-inch (2.5 to 5 cm) thick layers of nitrogen-rich materials such as compost, fresh untreated grass clippings, or even organic fertilizer. Make a few layers, then cap the bed with a 3- to 4-inch (7.5 to 10 cm) layer of compost for planting. Let it all settle for a few weeks before planting.
4. **Planting**—Sow seeds of shallow-rooted vegetables, such as lettuce, arugula, and radishes, or plant transplants of deeper-rooted vegetables, such as tomatoes or eggplants, in the compost layer. As the season progresses, the layers will decompose and

settle, allowing the deeper-rooted veggies to tunnel into the layers and down into the native soil.

5. **Maintenance**—Hand cut or pull any weeds that appear on the top compost layer or through the holes in the tarp. Keep the bed well-watered during dry periods. Harvest as needed.
6. **Next Year**—To maintain this no-dig garden bed, every year, or before planting another crop, add a 2-inch (5 cm) layer of compost and a 3-inch (7.5 cm) layer of hay, chopped leaves, or straw as mulch.

## TOO MANY WEEDS

Weeds are nature's way of producing organic matter to build up the soil. Unfortunately, we are trying to grow vegetables, herbs, and flowers too, so often, the two are in competition. For a garden "gone to weed," you have a few options when converting to no-dig.

*All weeds aren't equal. Annual weeds are easier to control than perennials. Which control method you use depends on the weed.*

If you just have a few weeds germinating on top of your composted beds because they blew in, simply pinch them off at the soil line by hand or bury them under a thick layer of mulch or compost. If you have many annual weeds, cut them off at the soil line with a sharp, collinear, stirrup, or scuffle hoe, then add more mulch or compost. These hoes are designed to not dig into the soil but to scalp off the annual weeds at the soil line. This way, you won't bring weed seeds up to the surface where they can grow.

For perennial and harder-to-kill weeds, try one of the options I described in chapter 3—place a layer of cardboard on the soil and a poly tarp over the beds, or just build taller structured raised beds. The cardboard and tarp method weakens the weeds, allowing you to reclaim your garden. For tough-to-kill perennial weeds, you may need to leave the poly tarp on for a growing season or two to really weaken the weed crops. Of course, this may limit your use of the site for that year. For areas that aren't heavily weedy, you can poke holes in the poly cover to plant your transplants.

You can also do this reclamation activity in stages, covering sections of your garden with cardboard and poly tarp to kill the weeds while planting less weedy beds and covering them with a thick layer of compost and organic materials. Once you reclaim your garden from weeds, use edging or cut a deep edge around the beds to prevent creeping perennial weeds from intruding from nearby grassy or weedy areas. The reality for many gardeners converting weedy sites to no-dig is that it may take a few years to fully reach the desired goal.

# Green Manures and Cover Crops

Another way to increase soil fertility, reduce weeds, and limit certain pests is by using green manures and cover crops. Green manures and cover crops are living plants that add organic material to the garden after they die or are cut back by the gardener. It's a way to reduce your dependence on finished compost, especially if compost is expensive or not readily available in your area. Traditionally, green manures, such as buckwheat, are grown during the growing season and cut down in summer or fall, then left or tilled into the beds to add organic material. Cover crops, such as winter wheat, oats, and barley, are sown in late summer or fall and grown through the winter. They cover and protect the soil from winter weather in addition to supplying organic material. They're either killed naturally by freezing winter temperatures, cut down just before they set seed, or tilled under in spring.

*Green manures and cover crops, such as this lacy phacelia, are plants specifically grown to build up the soil fertility and structure. Yes, you can grow these using the no-dig methods.*

Green manures and cover crops are usually legumes or grasses. Legumes, such as clovers, peas, beans, and vetch, fix atmospheric nitrogen, adding this key nutrient to the soil for vegetable plants to use. Grasses, such as barley, oats, and ryegrass, add valuable organic matter, protect the soil from water and wind erosion, and sometimes inhibit weed growth through chemicals they exude into the soil.

At this point, you probably have an obvious question: “If these crops are typically tilled under to incorporate the organic material into the soil, how does cover-cropping work in a no-dig garden?” While it’s true farmers and large-scale market gardeners often till these cover crops and green manures into the soil to incorporate the organic materials, you don’t actually have to till them in to get the benefits. For a home gardener, choosing the right green manure or cover crop, chopping it down at the right time, and burying it in compost will provide the same benefits. These crops still improve the soil’s fertility, protect the soil in winter, and help open up compacted soils. The reason farmers till under cover crops is not just to incorporate the organic materials into the soil for planting, but also to kill perennial cover crops such as clover and alfalfa. If you grow annual green manures and cover crops or ones that die over winter in your area, there won’t be the need to till them under to kill them.

If you have an existing garden that has low fertility and high numbers of weeds, consider using green manures and mulches on the garden or individual beds for a whole year. You can also grow annual green manures, such as buckwheat, in the worst parts of the garden, while using the rest of the garden to grow your vegetables and flowers. Kill these annual green manures by cutting them down just before they set seeds and covering them with mulch. This will help the green manure break down and kill any weeds at the same time.

*Buckwheat is a great green manure crop. It grows from seed to flower in about one month, it's loaded with organic matter, and the flowers are favorites of pollinators. Just be sure to cut it down before the flowers turn to seeds, or it will become weedy.*

## SOWING GREEN MANURES AND COVER CROPS

When starting this process for the first time in a weedy garden, you may have to mow down the weeds, loosen compacted soil with an iron fork, and even hand-remove some weeds to sow your cover crop. Once cleared, sow your cover crop seeds and water well. Hand chop or lightly hoe any weeds that are competing with your cover crop for the first few weeks. Once established, allow the cover crop to grow up and smother any weeds trying to grow. Right before flowering, when the cover crop has the most organic matter, but before it sets seeds, either hand chop or use a string trimmer to cut it down. I like using my manual hedge trimmers to chop and drop the cover crops, slicing them into small pieces that fall on the bed and decompose faster. Leave the chopped-up organic materials on the bed to decompose for a few weeks and add compost on top before planting.

*Cover crops that overwinter in the no-dig system either die due to the cold or are cut back in spring before they go to seed. Here, a cover crop of mustard has just germinated in a framed no-dig bed.*

If you used this technique in spring or early summer with a green manure crop, then, if there is time, sow another round of green manure crops and follow the same technique. In mild winter areas you can keep this technique going year-round, adding lots of organic matter to your beds. You can also grow the green manure in spring, chop it down in early summer, let it decompose for a few weeks, cover it with a layer of compost, and sow a vegetable crop that will mature in late summer, fall, or winter. I'll talk more about using cover crops and green manures to maintain your no-dig beds in chapter 5.

# Cover Crops for No-Dig Gardening

Here's a chart of some of the best options for cover crops and green manures to help build fertility and reduce weed competition in a no-dig garden.

| COVER CROP | COMMENTS |
|---|---|
| **Annual Ryegrass** | Good summer or fall crop. Germinates and grows quickly, widely available, inexpensive seed, extensive root system, shades out weeds. Will winter-kill in cold-winter areas. Otherwise mow down when flowering in spring and cover with compost to kill. |
| **Buckwheat** | Good summer or fall crop. Will die with frost. Fast growing and produces lots of organic matter. Suppresses weed growth and harbors beneficial insects. Cut down when flowering. |
| **Spring Oats** | Good fall crop. Hardy to 15°F (–9°C). Harbors beneficial insects, holds nitrogen in soil, suppresses weeds. If not winter-killed, cut down in spring when seed is partially developed, but not mature. Cover with compost. |
| **Barley** | Good fall crop. Hardy to 10°F (–12°C). Holds nitrogen in soil, harbors beneficial insects, suppresses weeds. If not winter-killed, cut down when the seed head forms and cover with compost. |
| **Fava Beans, Soybeans, and Field Peas** | Good summer crops. Legumes that hold nitrogen in soil. Harbor beneficial insects. Chop down when flowering. |
| **Mustard** | Good summer crop. Fast-growing, suppresses weed growth and diseases in soil. Winter-kills at 26°F (–8°C). If not winter-killed, chop down when flowering. Allow three weeks to decompose before planting. |
| **Japanese Millet** | Good summer or fall crop. Fast growing, winter-kills with frost. Suppresses weed growth and holds nitrogen in soil. Cut down before it sets seed. |
| **Sorghum/Sudan Grass** | Good summer crop. Winter-kills with frost. Strong root system to break up subsoil. Suppresses weed growth. Holds nitrogen in soil. Cut down before seeding. |

*If you grow a cover crop that naturally dies back in winter in your area, then in spring, all you have to do is add compost and plant. In some cases, you can even plant right through the mown cover crop residue. Here, young watermelon seedlings are being planted in residue from a previous cover crop of lacy phacelia.*

*Annual ryegrass is a good overwintering cover crop to grow in cold areas, since it will naturally die in winter.*

The easiest way to use this technique in cold-winter areas is to grow a tender annual cover crop, such as oats, that will winter-kill in your area. Plant in late summer or early fall. The crop will grow into winter, depending on your weather and your selection, eventually succumbing to the cold temperatures. Even though the cover crop will die in winter, it still has benefits. The roots will help hold the soil and open air and water spaces, and the dead tops add a protective mulch over the bed, preventing erosion. In milder areas, the cover crops may not die in winter. You'll have to cut them down at the right time in order to kill them without having to turn over the soil.

There are some cover crops that survive even cold winters and are not as amenable to no-dig gardening. Winter wheat and winter rye are hardy to –25°F (–32°C). They will overwinter and form tall seed heads in spring and early summer, making them hard to manage. Low-growing perennial grasses and hardy vetches and clovers will overwinter in many areas and will be difficult to kill in spring. You could experiment with mowing them down and smothering them, but they'll quickly turn weedy if your efforts fail. So, picking the right green manure or cover crop for your area is important.

*Chapter 5*

# PLANTING AND GROWING IN YOUR NO-DIG GARDEN

*After your bed is built, it's time to get planting!*

After all the talk about siting, building a no-dig bed, and renovating your existing garden to no-dig, it's time to get planting. Planting vegetables, herbs, and flowers in a no-dig garden isn't much different than planting in any other garden. However, there are some considerations regarding planting preferences, the size of your garden, where you live, and economics. Let me explain.

## Seeding vs Transplanting

In my younger days as a gardener, many vegetables and flowers were primarily available as seeds. That has all changed. If you go to a garden center now, you can purchase pretty much any flower, herb, or vegetable as a transplant. I've even seen peas, sweet corn, and beets sold as transplants. I'm a bit of a nostalgic gardener, so I still start many of my annual flowers and vegetables from seeds under grow lights indoors in winter. This way I can try many new and heirloom varieties that may not be available as transplants at the local garden center. It's also cheaper to grow your own transplants when you have a large no-dig garden. And you can control when the transplants are available to plant.

That being said, certain plants, such as beans, peas, squash, basil, marigolds, and zinnias, germinate and grow pretty reliably from seed when sown directly in the ground. Other vegetables, such as carrots and parsnips, are best grown from seeds and rarely found as transplants. But there's more that can go wrong when direct seeding compared to planting transplants. Seeds are more susceptible to problems including certain pests, variable weather, drying out, and rotting in cold, damp soils. Plus, for tomatoes, peppers, and other plants that need a jump start in regions with shorter

growing seasons, you'll need a grow light set-up indoors to start the seeds early. So, if you have a small garden and don't want to deal with seed starting indoors, it might make more sense to shop locally for healthy transplants whenever possible.

In a no-dig garden, it also makes sense to start with transplants for most vegetables, flowers, and herbs, especially if you're gardening in a cool, moist spring climate. Many no-dig gardeners use mulch or cover crops (as described in chapter 4) to protect the soil over winter. But this also slows the warm-up of the soil in spring, delaying seed planting for warm-season crops such as beans and basil. You can move aside the mulch and let the soil warm for a week or so, as I described in the deep-mulching section of on page 39, and then sow seeds. But if you have a plan for growing early crops or succession crops later in summer, you'll want to plant as soon as possible. If you garden in a warm-winter climate or aren't covering your garden with mulch in winter, this may not be an issue.

In essence, when choosing to seed or transplant your vegetables, herbs, and annual flowers, consider how much you want to spend on transplants, whether or not you want to purchase seed starting equipment, the size of your garden, and the length of your growing season. Perhaps you'll do a little of both. For example, in a small no-dig garden you may decide to buy transplants of large plants—such as tomatoes, broccoli, and peppers—or plants that would benefit from an early start, such as parsley, basil, squash, cucumber, and melons. You can save direct seeding for easy-to-grow crops such as sunflowers, nasturtiums, poppies, cilantro, beans, peas, lettuce, arugula, and root crops. Some no-dig gardeners use the deep-mulching technique (see page 39) to sow tubers, such as potatoes, by simply dropping them on the soil surface and mulching heavily. There's no right or wrong way to garden, just different ways.

## Rows vs Blocks

Another planting decision to make is how you want to arrange the plants in the bed. The traditional way to grow vegetables and herbs is in straight rows. This farming method was necessary when using horses to plant and weed large areas, and the tradition continued into the machine age. But home gardeners don't have to plant in straight rows. In fact, it's less efficient and wastes space to do so.

Before I totally poo-poo the idea of row planting, let me be devil's advocate with myself. When you plant in straight rows, especially when sowing seeds, you know where to expect the seedlings to emerge. It's also easier to identify the germinating plants with empty seed packets placed as markers at the end of the rows. You can weed easier between rows with a hoe and walk between the rows. If images of Norman Rockwell paintings are coming to mind, you're on target. This is how my grandparents and parents gardened.

*Sowing seeds in blocks rather than in rows reduces the space between plants, leaving less room for weeds. Since no-dig beds are rich in compost and fertility, close spacing doesn't necessarily reduce yields.*

Okay, back to the present. Just from that description, you can see that row plantings aren't necessary in a no-dig garden. We don't want to weed with hoes, if possible. We don't want to walk on the soil, compacting it. And we certainly can identify the seedlings correctly, especially if few weeds are germinating due to our not turning the soil. So, let's grow in blocks instead!

*Once plants mature in the block-planting method, they shade the soil, keeping it cool and moist; their canopy prevents weeds from germinating.*

By broadcast seeding or planting in a block or wide row, you'll be able to plant more seeds and transplants per square foot area. In a no-dig garden, the soil is very healthy, so spacing plants closer together is possible without adversely affecting the yield. This allows plants to shade the soil in summer, keeping it cool and moist and preventing any weed seeds that find their way into your no-dig bed from germinating and growing. You can grow plants in different patterns based on the size of your bed and the plants. For example, I maximize the space in our tomato bed by planting in a zig-zag pattern to use as much space as possible. The seeds of carrots, beets, and greens are broadcast or sprinkled in a section of the bed, covered with a light layer of soil, and kept watered. They are thinned and eaten as

they grow. Get creative with your plant spacing to maximize the amount of veggies you produce in your garden.

## Interplanting and Succession Planting

Another way to utilize space in your no-dig bed more efficiently is to interplant (also called intercrop). Interplanting takes advantage of the growth rates and shapes of certain vegetables and herbs. If you pair the right veggies and herbs together, you can use as much of the planting space as possible. To get started, it’s important to know the difference between cool-season and warm-season vegetables and herbs.

Cool-season plants grow well in spring and fall in most climates. In warm-climate areas, these are the crops you’d grow in winter too. They include spinach, kale, lettuce, peas, beets, scallions, cilantro, radishes, and arugula. Warm-season crops thrive during the heat of summer, or during the spring and fall in warmer climates. They include tomatoes, peppers, eggplant, squash, melons, beans, and basil.

*Intercropping quick-maturing plants between larger, slow-growing plants uses up excess space in the bed, reduces weeding, and allows you to grow a smaller garden that's very productive. Here a warm-season crop of basil is planted between rows of cool-season cilantro and lettuces.*

Once you have your warm- and cool-season veggie and herb lists, look at plant sizes and shapes. Interplanting is about matching slow-growing, warm-season plants with faster-growing, smaller, cool-season plants. For example, in spring you usually plant tomatoes and squash 3 feet (0.9 m) apart to account for the ultimate size of the plants. This leaves a lot of open space in the bed for weeks until the tomato and squash growth really kicks in. You can take advantage of that space by planting faster-growing cool-season crops, such as radishes, lettuces, and arugula, between the tomatoes

and squash. By the time the tomatoes and squash get large enough to fill in that space, you will have harvested a nice crop of greens and radishes. I've even intercropped greens and radishes between broccoli and brussels sprout transplants. Even though these are all cool-season-loving plants, the broccoli and brussels sprouts take a while to get large enough to interfere with the growth of the smaller plants.

*A simple way to avoid producing a glut of one crop is to succession plant the same vegetable multiple times during the growing season. For example, plant a handful of carrot seeds every few weeks for a constant supply without getting overwhelmed. Here you can see the oldest carrot plants on the right side of the bed and newly germinated carrot seedlings on the left side of the bed.*

The other cool gardening technique that allows you to grow more in less space with less work is succession planting. Succession planting is just what it sounds like. One crop follows another so you never have open space in your no-dig garden beds. Again, we use the warm-season and cool-season plant distinction. Plant fast-maturing spring crops, followed by heat-loving summer crops, followed by cool-loving fall and winter crops. A good example of succession planting is to grow peas, lettuce, spinach, cilantro, and radishes in spring; as soon as they finish, plant cucumbers, basil, squash, beans, and melons in their place. When fall comes, remove

the warm-season crops and plant kale, spinach, parsley, and arugula for fall and winter harvest. These fall crops can take a light frost and continue to produce. You may have to adjust this schedule depending on where you live. In short-season growing areas, you may only be able to do two crops in each bed. In hot-summer/mild-winter areas, you might skip summer plantings, (due to excessive heat) and extend the succession into winter. Experiment with different crops to see what works best in your area.

One important requirement for successful succession planting is being merciless with your plants. Harvest the spring crops as soon as they can be eaten to make room for the summer crops. For garden peas, the main harvest occurs in a concentrated time period, often followed by a few straggling peas for weeks. Don’t wait. Once the main harvest is finished, chop and drop the plants to make room for the summer crop. The same is true with the summer crop. Even if there are a few cucumbers or beans left on the plant, cut and remove them once the main production is finished to make room for a fall crop. Between each new crop, remember to add a 2- to 3-inch (5 to 7.5 cm) layer of compost to help the next crop grow.

# Polyculture Beds

Polyculture has nothing to do with the Pacific Islands. It's a permaculture technique based on traditional ways of gardening, but it's been enhanced over time. One of the most famous polycultures is the three sisters garden. Corn grows tall and is intercropped with pole beans and winter squash. The beans grow up the cornstalks while fixing nitrogen (being a legume) for the corn to use. The squashes trail along the ground, keeping the soil cool, weed-free, and moist for the corn and beans. Think of polyculture as an advanced version of intercropping. Polycultures take advantage of different plant growth rates, shapes, sizes, and nutrient needs.

Polycultures are plants that will naturally grow well together as companions, using as much of the underground and aboveground space as possible without limiting each other. It's like a perfect relationship!

Modern polyculture beds look different than traditional garden beds. Instead of rows or blocks of the same vegetable, herb, or flower, everything is planted together. This can be a bit disconcerting when first starting out, but it does work well.

There are many polyculture recipes. It's best to start with a no-dig bed that is fertile and established enough to not have weed seeds germinating. The fewer weed seeds in your bed, the less chance of pulling out a vegetable or herb by mistake. You can sow seeds, plant transplants, or use a mixture of both in your polyculture bed. The simplest polycultures grow a mix of greens, root crops, herbs, low-growing annual flowers, and brassicas.

*Polyculture beds mix and match vegetables, flowers, and herbs based on their growth characteristics, light requirements, and nutrient needs. It looks like a jungle, but it can be very productive.*

When planning, mix veggies, herbs, and flowers that have different growth characteristics. For example, sow lettuce, arugula, bok choi, mustard, beets, carrots, and parsnips together in the bed. You'll have shallow-rooted plants mining nutrients in the top layer of the soil (lettuce, arugula, beets), while other plants right next to them mine nutrients from deeper regions (carrots and parsnips) without competing. This is also true for the plant tops. Planting scallions, leeks, and dill next to beans and nasturtiums works well. The broad leaves of the beans and nasturtiums shade the soil, keeping it cool and moist for other crops. The scallions and dill have more upright, narrow growth that can reach above the foliage of the beans and nasturtiums without shading them out.

*A mature polyculture bed may look like chaos, but the plants are strong. It's a great way to grow a variety of vegetables, flowers, and herbs in a small space without much care.*

Here's a simple polyculture schedule to follow. Sow different varieties of greens (lettuce, mustard, arugula) and radishes on the bed in spring by mixing the seed together then broadcasting it on the bed. These plants will germinate quickly and provide a green cover, keeping the soil moist and protecting slower-germinating veggies and herbs. At the same time, sow root crops, such as carrots, beets, and parsnips; alliums, such as green onions and leeks; herbs, such as dill and cilantro; and flowers, such as nasturtiums and marigolds, by broadcasting seed the same way. Harvest the greens when young, snipping them off at the ground level, trying not to disturb the smaller veggies, herbs, and flowers and giving them more room to grow. As the season progresses, plant transplants of broccoli, kale, and brussels sprouts, and seeds of bush beans and basil in any open spaces created when you harvest root crops, onions, and other plants.

The bed will look chaotic for those accustomed to rows or blocks of similar plants. However, polyculture beds have several advantages. They don't take up lots of space and don't produce too much of any one crop, so they're perfect for those wanting only a handful of veggies every few days from their garden. The harvest is spaced out because different plants mature at different times. The plants cover the soil from spring until fall, protecting it from drying out so you can water less. You'll also have little to no weeding since any weed seeds will by shaded by your plants. As long as your no-dig bed has fresh compost added before each planting, you shouldn't have to supplement the bed with fertilizer. You also should have fewer pests, since the bed is a mix of plants. Some of the plants (e.g., onions and some herbs) are natural disease and insect repellents. And pests will have a harder time finding their choice plants in the jungle of growth.

## No-Dig Garden Care

Now that you've decided on your planting scheme and have seeds coming up and transplants in the ground, you'll have to maintain your no-dig garden. As I've been saying, a healthy no-dig garden bed should require less work. The fertility will be high due to the organic materials and compost you've been adding. Weeds are not encouraged to sprout since you aren't turning the soil, and any weed seeds that blow into your beds can be smothered with mulch or compost, or the weeds can be snipped off when young by hand or with a sharp, flat hoe. Pests and diseases should be less prevalent due to the high fertility of your beds and the diversity of plants that you're growing. Ahh, a perfect garden world.

*On top of the many benefits I've mentioned, these no-dig beds also create ecosystem diversity, so they have fewer insect and pest problems.*

But the reality may be a little different, especially for transitioning or newbie no-dig gardeners. I covered ways to deal with soil fertility and weeds in chapter 4, so I won't repeat myself here, but I do want to add more

information on composting, harvesting, season extending, and garden cleanup.

## LONG-TERM MANAGEMENT OF SOIL FERTILITY

It should be clear that one of the keys to success of the no-dig method is compost. Whether it be finished compost you buy locally and use annually, compost you make at home in a pile or bin, or compost that happens from the natural decomposition of organic materials you add to your garden, compost is king.

Composting is a great way to build soil fertility if you have the organic materials, time, space, and patience to make a compost pile. Composting is also important for the planet. It's estimated that 30 percent of the waste sent to landfills is compostable. In some regions, sending food and yard waste to the landfill is illegal. By composting at home or in the garden, you'll reduce the amount of climate-warming methane gas that gets released into the atmosphere. I describe the basic steps to making compost here.

If you can't make your own compost and can't afford to keep buying local compost each season, there are some other options.

As I described in chapter 3, organic mulches—such as hay, straw, grass clippings, and chopped leaves—used over time in the garden can build up the fertility and natural structure of your soil. As this process is happening, you can supplement your garden with organic fertilizers, especially for spring crops. Organic cottonseed meal, alfalfa meal, and fish emulsion are some examples of low-impact fertilizers that give young plants a boost.

*To build a compost pile that heats up and decomposes quickly and effectively, mix 3 parts brown materials with 1 part green materials by volume, moisten, and keep covered.*

*Compost bins can be made from all different types of materials. Plastic or metal bins are better for keeping out critters such as raccoons and rats.*

You also could integrate green manures and cover crops, as I mentioned in chapter 4, into your planting scheme. Green manures and cover crops should be chopped and dropped on the garden bed to not disturb the soil structure. They should also be covered with mulch or a layer of compost before planting to aid their breakdown and boost soil fertility.

Once your garden has transitioned into no-dig and you have your systems working well, adding extra fertility beyond compost, cover crops, and mulches shouldn’t be necessary.

## HARVESTING

The best part! Your no-dig garden should produce an abundance of vegetables, herbs, and flowers, even in the first year, without lots of labor and time. As with any garden, harvest the plants as you need them and when they’re at the right stage of maturity. The no-dig harvest method, though, stays true to the tenet of not disturbing the soil. When harvesting fruiting crops, such as tomatoes, beans, and squash, this isn’t an issue. But for greens and root crops, you may want to adjust your harvesting technique.

## Building a Compost Pile

1. **Right Site and Bin—**First, determine if you want to make lots of compost or if a single pile will do. Site the compost piles or bins on a flat, well-drained location on the ground, if possible, so earthworms and other decomposers can migrate into the pile.
2. **What to Compost—**Make a list of brown (high carbon) and green (high nitrogen) organic materials you have in your yard or area. See the chart on pages 36 to 38 for a list of materials to add to the compost pile, in addition to kitchen scraps like coffee grounds, egg shells, and tea bags.
3. **Building the Layers—** Collect your brown and green materials. Start by making a 6- to 8-inch (15 to 20 cm) thick layer of brown materials on the bottom of the pile. Add some chunky brown materials, such as wood chips and shavings, on the bottom to create air pockets for the aerobic bacteria to work. Then add a 2- to 3-inch (5 to 7.5 cm) thick layer of green materials. Water to moisten the materials. Continue this layering until you reach the top of the bin. Your pile should be at least 3 feet (0.9 m) tall and wide, but no taller than 5 feet (1.5 m). Cover the pile to prevent it from drying out or getting too wet.
4. **Let It Cook—**Ideally, your pile should reach 130°F (54°C) for about three days to kill off any plant pathogens, insect eggs, and weed seeds. If the pile gets too hot, it can kill off the billions of good microbes in the compost. When the temperature starts to drop, give the pile a good mix. This will allow the outside materials to be moved to the inside of the pile, and the whole pile should heat up again. If the pile doesn't heat up, add more green materials. If the pile is smelly and wet, add more brown materials, especially wood chips or branches, and don't water it as much.
5. **Finished Product—**After a few weeks to a few months, your compost pile should have an earthy smell and feel, and it should be dark-colored. You may have some pieces of brown materials visible, but mostly it should look like soil. That's your sign it's ready to use.

*A finished compost pile should have very little of the original organic materials visible. Instead, it should have a dark color and an earthy smell.*

Instead of pulling out heads of greens, such as lettuce, spinach, and bok choi, cut the plants at the soil line. Leave the root system in the ground to decompose, not disrupting the soil life. Use the same technique for cauliflower, cabbage, and any other crop where you normally remove the whole plant at harvest time.

*No-dig gardening is all about not disturbing the soil. When harvesting greens, cut the plants at the soil line instead of pulling out their roots.*

For root crops, it's literally impossible to harvest without disrupting the soil. However, with a healthy, compost-laden soil in the no-dig system, you should be able to pull roots of radishes, carrots, beets, and parsnips without severely impacting the soil. Gently wiggle and tug the root crops from the moist soil. Avoid digging with a trowel to get the roots out, if you can. After harvest, cover the area with a layer of mulch to prevent any weed seeds that might have made it to the surface from germinating.

*For some vegetables, such as carrots and parsnips, you will have to disturb the soil to harvest. But try to gently pull, instead of digging out the roots, to minimize the soil damage.*

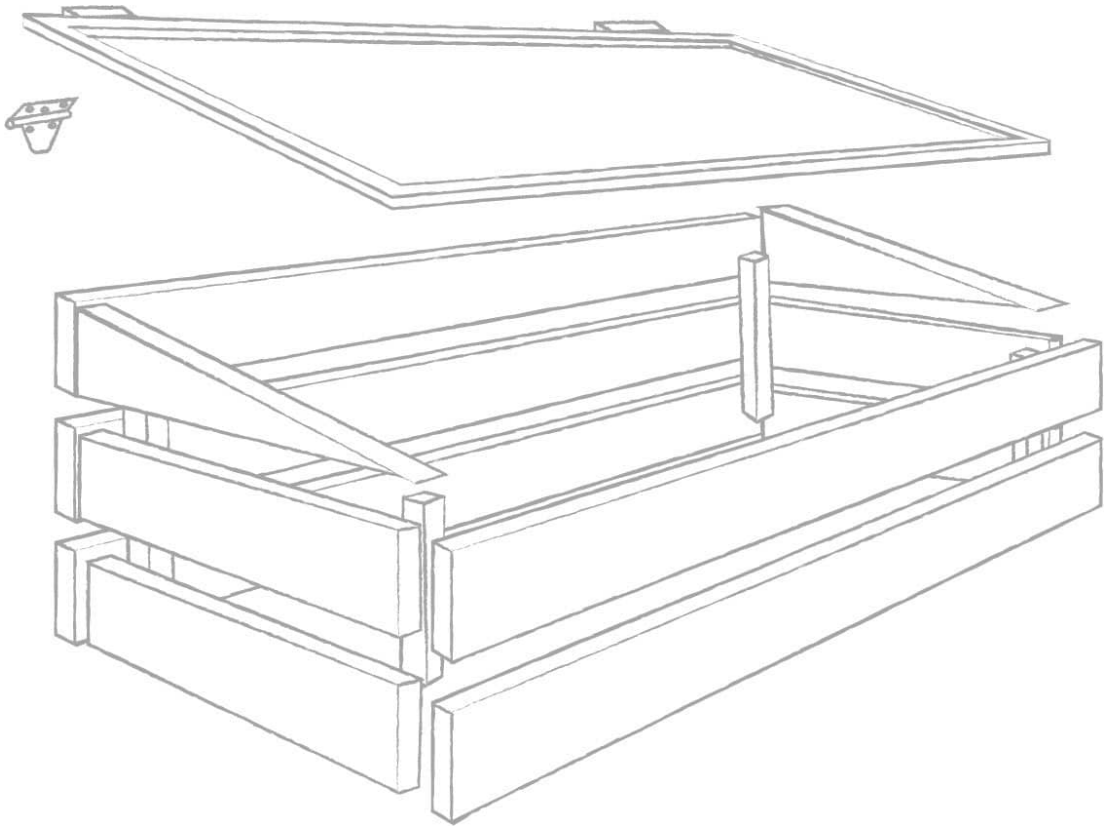
## GARDEN CLEANUP

At some point, you'll need to remove spent plants to get ready for winter, plant another succession crop, or sow a cover crop. Instead of the traditional cleanup method of pulling out and composting plants, in a no-dig system, it's better to chop and drop spent healthy plants. Once the plants are finished producing or have been killed by frost, don't yank them out and disturb the soil. Instead, chop up the foliage and stems and leave them on the bed. Chop right down to the soil line, if possible. This adds organic materials to the bed and saves you a ton of work. It's like composting in place! My tools of choice for chopping and dropping are a manual hedge trimmer and a hand pruner. For plants with really thick stalks, such as broccoli, corn, and sunflowers, I use a lopper. How finely you chop up the plant material is up to you. The smaller the pieces, the quicker it will return to the soil as compost. Note that chopping and dropping is not a good method for your plants if they were heavily diseased or insect infested.

## SEASON EXTENDING

If you really want to extend growing, here are some season-extending tips and products you can use.

- Use hoops to support a sheet of clear plastic (see photo on page 71). The plastic will not only protect plants from cold, but it also will heat up the soil. It's a good technique to use, especially in spring, to get your plants off to a fast start. Vent the tunnel on sunny days.
- Protect important plants individually with a variety of cloches. Small glass or plastic cloches are best used on low-growing or young plants. They should be vented on sunny days so the plants don't fry in the heat. Larger plant-protection covers will protect taller plants, such as dwarf tomatoes, basil, and hot peppers, from frost.
- Cold frames take your season extending to another level. There are many ways to build your own cold frame. I've built a simple cold frame for less than $30 using recycled lumber, PVC pipes, hardware, and clear plastic secured over the top. You could also use old window sashes to cover your cold frame. I've even gone real simple, using four bales of hay surrounding a bed and covering the top with clear plastic. On the opposite extreme are commercial cold frames with glass, high-end fabrics, and zippers to gain easy access. It's just a matter of how far you want to go to get food and flowers early or late in the season.



*I built a simple cold frame using spare boards, recycled window sashes, and some hinges. I kept the cold frame vented on sunny days by using a board to keep the top ajar.*

*Sometimes it's not the cold that's an issue for your plants, but the heat. Drape a shade cover over plants, protecting them from the afternoon sun, so they can grow even in the heat.*

*Protect individual prized plants from weather damage with a cloche. Be sure to vent the cloche by tilting it on sunny days to keep the plants from getting too hot.*

*Creating a covered bed using PVC pipe and plastic sheeting affords plants an extra layer of protection from cold temperatures.*

- Greenhouses are the ultimate season extenders. We have an unheated greenhouse in our cold climate and can harvest through the winter with heavy, winter-weight floating row covers over the beds inside the greenhouse. Growing in a heated greenhouse is the luxury car of plant protection.
- In hot-summer climates, instead of season extending by keeping out the cold, you can extend the season by keeping out the heat. Usually it’s the summer heat that limits what you can grow in hot climates. By erecting shade cloths over beds, you can extend the spring harvest further into summer and start your fall garden sooner.

*Chapter 6*

# VARIATIONS ON THE NO-DIG CONCEPT

*Straw bale gardening is one of several different nontraditional no-dig methods.*

Mostly, the term no-dig gardening refers to growing plants in raised beds on the ground. But in this book, I want to expand that definition to include some variations on the no-dig theme. Some of these variations don't follow the traditional no-dig methodology, but the goal is the same—growing healthy plants in soil that is rich in compost while honoring the structure and biology of the soil. There are just different ways to get there.

In this chapter, I'm going to focus on three unique variations to no-dig, including straw bale gardening, hügelkultur beds, and keyhole gardening. Each of these methods has advantages and disadvantages, depending on your setting. But they all are ways to grow a healthy garden while preserving the soil life.

## Straw Bale Gardening

Straw bale gardening has become all the rage, with many books and websites talking about the various methods. But straw bale gardening actually has a long history. Ancient cultures, such as the Egyptians and Aztecs, grew grains such as wheat, rye, and barley. They found the straw stalks remaining after harvest could be cut, piled, and left to decompose to become a good growing medium for plants.

The popular version of straw bale gardening has some modern twists, such as using straw bales from farms and specific recipes for watering and fertilizing the bales. But the theory is the same. It comes down to conditioning bales with water and fertilizer so they start decomposing. Then you can plant right into the top of the bales, taking advantage of the heat

and nutrient-rich compost being produced. At the end of the growing season, you're left with a partially decomposed bale for future planting or to add to a compost pile or no-dig bed.

Straw bale gardening has many advantages. It's a way of growing vegetables, herbs, and flowers in places where you normally couldn't grow plants. Bales can be set on concrete, compacted gravel, toxic urban soils, infertile soils, patios, and asphalt driveways. Straw bale gardening has fewer weeds than traditional gardening. It's elevated, so it's easier to work with and is well drained. I've also found the raised bales deter small animals and some insect pests from attacking plants. It's less work since you aren't prepping any soil. And it's yet another way to make nutrient-rich compost.

*Straw bale gardening is a way to grow vegetables, flowers, and herbs in poor soil conditions using a straw bale, fertilizer, and some compost.*

*Straw bale gardening is great in urban settings, because you're not dependent on the health of the native soil for good production.*

In fact, you can use straw bales in your new or transitional no-dig garden as a way to build up the soil without sacrificing a growing season or having to gather lots of organic materials. Here's how:

Place the bales on your new no-dig site. In a 4- by 4-foot (1.2 × 1.2 m) raised bed, depending on the size of your bales, you can place about four bales in the bed, narrow side up. The first year, grow plants on a straw bale as I describe later. The bales will smother any weeds in the bed. The second year, the bales have decomposed, and now you have a base of partially decomposed compost to continue with building a traditional no-dig garden.

There are downsides of straw bale gardening, however. You'll need a ready source of straw. You'll also need a good source of water to condition and keep the bales wet. Fertilizer, organic or chemical, is necessary to jumpstart the decomposition process in the bales. The bales are big and heavy, so they can be hard to move, especially once wet. And the bales may break down quickly and start flopping before the end of the season and before your plants are finished producing. But even with these disadvantages, straw bale gardening still may be the best way to garden in your setting. Let's get into the details of straw bale gardening.

## GETTING STARTED WITH STRAW BALES

Find a sunny, convenient location in your yard to place the bales. To start, you can buy a few bales. Once you get the hang of straw bale gardening, you can set up a whole garden of bales! Ideally, your site will be close to a water source. I place our straw bales against a fence so I can trellis climbers, such as cucumbers and bitter melon, up the fence.

*Straw bales (at right) have few weed or grain seeds in them. Hay bales (at left) may have weed seeds. If using hay, look for the first-cut bales in early summer that will have fewer weed seeds.*

While the method is called straw bale gardening, you can use hay bales as well, but hay has some drawbacks. Straw is the stalks left after grain heads have been harvested. There are few seeds left to sprout in the bale. Hay is a mix of grasses and weeds that may be rich in weed seeds, especially if the bales are harvested in late summer. Straw is more expensive and may be harder to find, depending on where you live. Hay is cheaper and probably easier to find. I've used both in my garden. If you use hay, it's best to get bales from the spring cutting. They tend to have fewer weed seeds. Place the bales so the baling twine is parallel to the ground with the narrow side of the bale facing up. In dry climates with salt-laden soils, place a barrier of coarse gravel or plastic under the bales so the salt doesn't leach into the bale and adversely affect plant growth.

## CONDITIONING THE BALES

Once you have bales in place, they need to be conditioned, which means adding water and a nitrogen fertilizer source to jump-start the decomposition process. Conditioning usually takes about two weeks—then you can plant. Water the bales slowly every day so the water soaks into the center of the bale and doesn't run off. There are many recipes for the fertilizer application schedule. See details on page 77 and the resource section for some ideas. A basic recipe is to add a full dose of fertilizer every other day for the first week. Then taper to a one-half dose of fertilizer every other day for the second week. You'll know you're adding enough fertilizer if the bale starts getting warm inside as it breaks down.

*Before planting, condition your straw bales with water and fertilizer for two weeks. Once they start to heat up, decomposition has started and you can plant soon afterward.*

*Plant seeds in a straw bale by first laying a 2- to 3-inch (5 to 7.5 cm) layer of compost on top of the bale. To plant seedlings, simply make a hole in the bale, add compost, and plant.*

After two weeks, it's time to plant. Most vegetables, herbs, and flowers grow well in a straw bale garden. If sowing seeds directly into the bale, add a 2- to 3-inch (5 to 7.5 cm) thick layer of compost on top of the straw bale. This will give the young seedlings a nutritious base to germinate and start growing. You can plant in rows or blocks as I described on page 60. If transplanting seedlings of tomatoes, broccoli, basil, melons, zinnias, geraniums, or other large plants, dig or pull away some of the straw, add a small handful of compost into the hole, and transplant. The hole and compost will help anchor the transplants until their roots have gotten established in the bale. Keep watered as you would any raised bed. You'll find the bale needs less water once it's saturated and starting to decompose. This is especially true if you live in a humid summer area.

If you notice young plants are yellowing and not growing strongly, it could be due to too much water, not enough water, or not enough nitrogen. Simply check the dampness of the bale and adjust your watering. Also, you

can add high-nitrogen fertilizers, such as fish emulsion and organic cottonseed meal, to give young plants a boost.

## Fertilizers for the Straw Bale

There are many ways to fertilize your straw bale. For those using synthetic chemical fertilizers, a full dose is equal to 1 cup (192 g) of a water-soluble 20-20-20 fertilizer. Avoid using granular chemical fertilizers because the granules may burn young roots. For organic gardeners, 3 cups (710 ml) of liquid fish emulsion are equal to a full dose. I've also used 3 cups (227 g) of a blended organic 5-5-5 granular fertilizer as a full dose with good results. Other high-nitrogen, organic granular fertilizers, such as organic cottonseed meal, blood meal, and alfalfa meal, work well. You could also experiment with a high-nitrogen compost, such as composted chicken manure, as an alternative. Whatever you use, your straw bale should be heating up within the first week or so. You can use a soil thermometer stuck inside the bale to watch the temperature rise!

*Keep plants growing strong in the straw bale by adding fertilizer as needed. Once the bale starts breaking down, I find little extra fertilizer is needed.*

## HARVESTING AND BEYOND

Once your straw bale is planted and growing, treat it like any other raised bed you've grown. Keep it watered, add supplemental compost or organic fertilizer as needed, and harvest when ready. You may see mushrooms growing in your straw bale bed. Don't worry, this is natural, and the mushrooms won't harm your plants. However, it's best not to eat them unless you've positively identified them as safe. Over time, your straw bale may start flopping as it continues to decompose. That's natural and not cause for concern.

*After a season of growing plants, your straw bale may look a little sad. That's okay. Use the partially decomposed bale as a base for a no-dig bed or throw it into the compost pile.*

At the end of the season in warm-winter areas, cut back the plants to the soil line, add some compost on top, and grow another crop in your decomposed straw bale. In cold-climate areas, cut back the plants and move the remaining partially decomposed bale into a garden bed or compost bin

to finish breaking down. As I mentioned earlier, your partially decomposed straw bale can be used as a layer of a new no-dig garden as well. Simply add compost or organic material layers on top of the partially decomposed straw bale, as I described in chapter 3, and get no-digging!

## Hügelkultur

I first heard about hügelkultur beds from a friend looking for a productive use for extra logs and large branches from his woods. I since have discovered this is a centuries-old technique that allows gardeners with lots of woody materials to recycle them and make growing beds. It's also a great way to sequester carbon in the soil to reduce global warming.

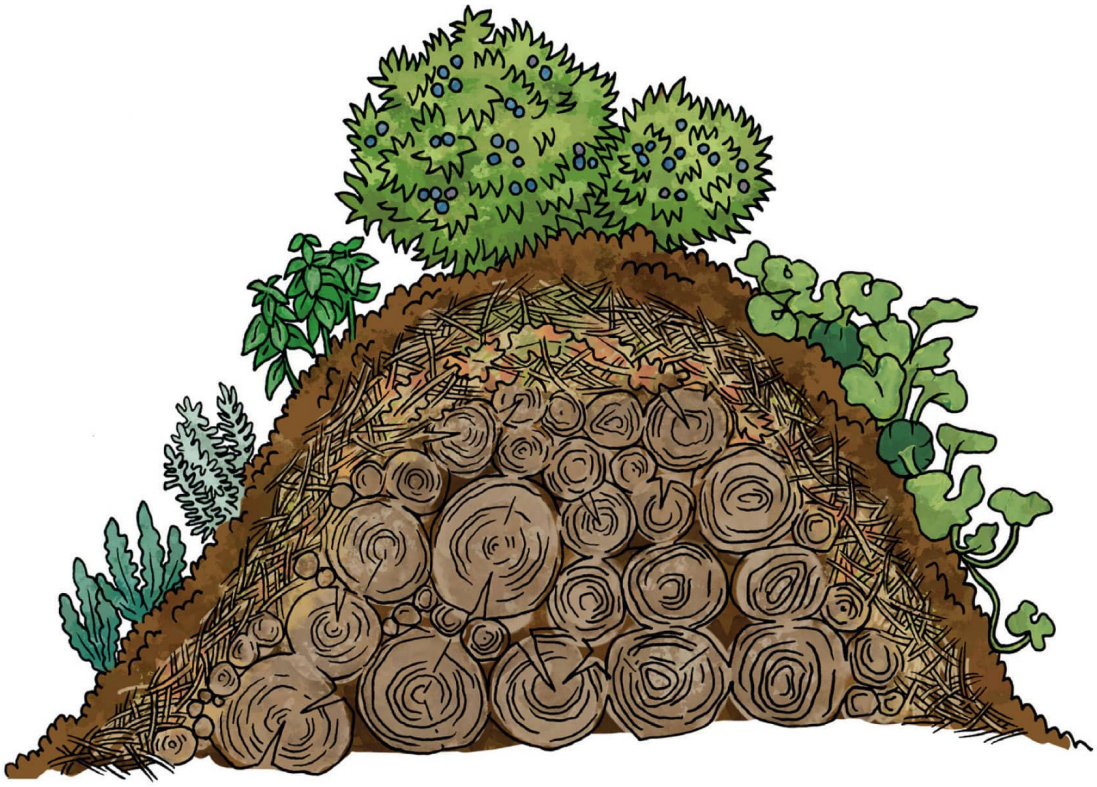
Hügelkultur is a German word roughly meaning "hill mound" or "mound culture." It's a gardening technique started in Europe as a way to create no-dig gardening beds using excess soil and wood from the yard.

The concept is simple. Either build a raised bed on top of thin soil, a rocky area, or a compacted spot, or dig a trench to create your hügelkultur bed. Gardeners in dry areas often prefer digging trenches to preserve soil water, and they build the mound from there. If you live where it's rainy and flooding is an issue, building the mound on top of the existing soil helps with water drainage. Layer logs, branches, twigs, and leaves and cover with soil, compost, and more organic matter. Although not a no-dig method when creating the bed (you dig a trench and remove soil or mound dug soil on top of a raised hügelkultur mound), once established, you don't turn the soil. It's a way to allow the soil structure and biological life to thrive.

The advantages of a hügelkultur bed, besides reusing scrap wood from your yard, are many. As I've mentioned, any no-dig gardening method preserves the soil's microbial life, not disrupting beneficial bacteria, fungi, and other organisms in the soil. The beauty of using wooden logs, branches, and stems is that these materials break down slowly over time, providing food to all those soil organisms. They slowly release nutrients into the surrounding soil, allowing whatever plants you're growing on the top of the hügelkultur mound to absorb these nutrients. The beds stay warmer due to the decomposition, allowing your plants to grow later into the fall in cold climates. And the logs hold carbon in the soil, reducing its release into the

atmosphere. It’s much better for the environment than sending the wood to a landfill or burning it.

Because the woody material is so dense, it acts like a sponge, absorbing water, and it’s slow to dry out. This translates into a mound that doesn’t need watering unless you have extended dry periods. The larger the mound, the longer you can go without watering. Some mounds, built as tall as 6 feet (1.8 m), won’t need any summer watering at all depending on your location. The height of the mound also helps prevent the bed from waterlogging during heavy rains or spring snow melt. Also, if you build a tall mound, it’s easier to work without straining your back.



*Hügelkultur mounds are really layered like a lasagna garden. Add layers of organic materials on top of the logs so the whole mound will break down, hold water, and release nutrients for the plants.*

## BUILDING THE MOUND

The first step is to site the mound in an area where it won't be moved for years. Hügelkultur is a long-term proposition. The mound can last for twenty years, depending on the size of the logs that are decaying and the type of wood you're using. Also, consider what you'll be growing and how much sun those plants will need. Then look around your landscape for dead trees, logs, branches, and twigs. You can even use parts of live trees if you're doing some tree clearing. Hardwoods are usually best because they're slow to decay. In temperate forest areas, trees such as maple, alder, apple, cottonwood, oak, poplar, and birch are some of the best choices. Avoid using fresh wood loaded with natural rot-resistant chemicals, such as cedar, eucalyptus, redwood, and black locust. Also, avoid fresh black walnut wood. It contains chemicals that inhibit the growth of some plants. Evergreens, such as spruce and pine, are fine too, but are best if allowed to age a few years so the tannins naturally leach from the wood. You can make the wood pile as tall as you like and any shape you like. While many gardeners simply build a straight mound, some get creative with serpentine shaped mounds. Most gardeners build the log layer about 1 to 3 feet (30 to 90 cm) tall.

*Hügelkultur beds can be partially buried in a trench or mounded on top of the soil. The bigger the mound, the longer it will produce without having to add more organic materials.*

*This completed hügelkultur mound is ready for planting.*

Once you've piled and snugged in the wood, add a 1-foot (30 cm) layer of nitrogen-rich material. If you removed sod to create your hügelkultur mound, lay it on top of the wood, upside down, to decompose. Other materials to add include compost, fresh grass clippings, seaweed, and old manure. These materials will help the woody materials break down. If you're adding soil or compost, you can use garden soil, soil from the hole you dug to make the trench, or soil and compost brought in for other purposes. Build the initial bed so the top is sloped to avoid compaction of the soil. Cap the pile with a 6- to 12-inch (15 to 30 cm) layer of hay, straw, or chopped leaf mulch. You can also line the edges of the mound with logs or stones to define the bed better and prevent soil from washing away. The entire pile can be anywhere from 3 to 6 feet (0.9 to 1.8 m) tall. It will settle to a much lower height over time. You can build the beds lower, using thinner branches and layers, but the benefits of the decaying wood will be shorter.

*While hügelkultur mounds are usually used for growing vegetables, herbs, and flowers, some gardeners even grow berry bushes and fruit trees on their mounds.*

## GROWING ON A HÜGELKULTUR MOUND

Once you have your mound built, it's time to plant. There are a few things to keep in mind with your mound. The top will tend to be drier than the bottom, so grow plants that can tolerate dry conditions, such as squash, rosemary, and sweet potatoes, on top, and plants that like moisture, such as broccoli and brussels sprouts, toward the bottom.

Unless you added a good layer of compost and soil, the mound may be lacking nitrogen the first year as the microorganisms use the available nitrogen to break down the high-carbon logs and branches. Either add more compost or grow vegetables that tolerate lower nitrogen levels, such as

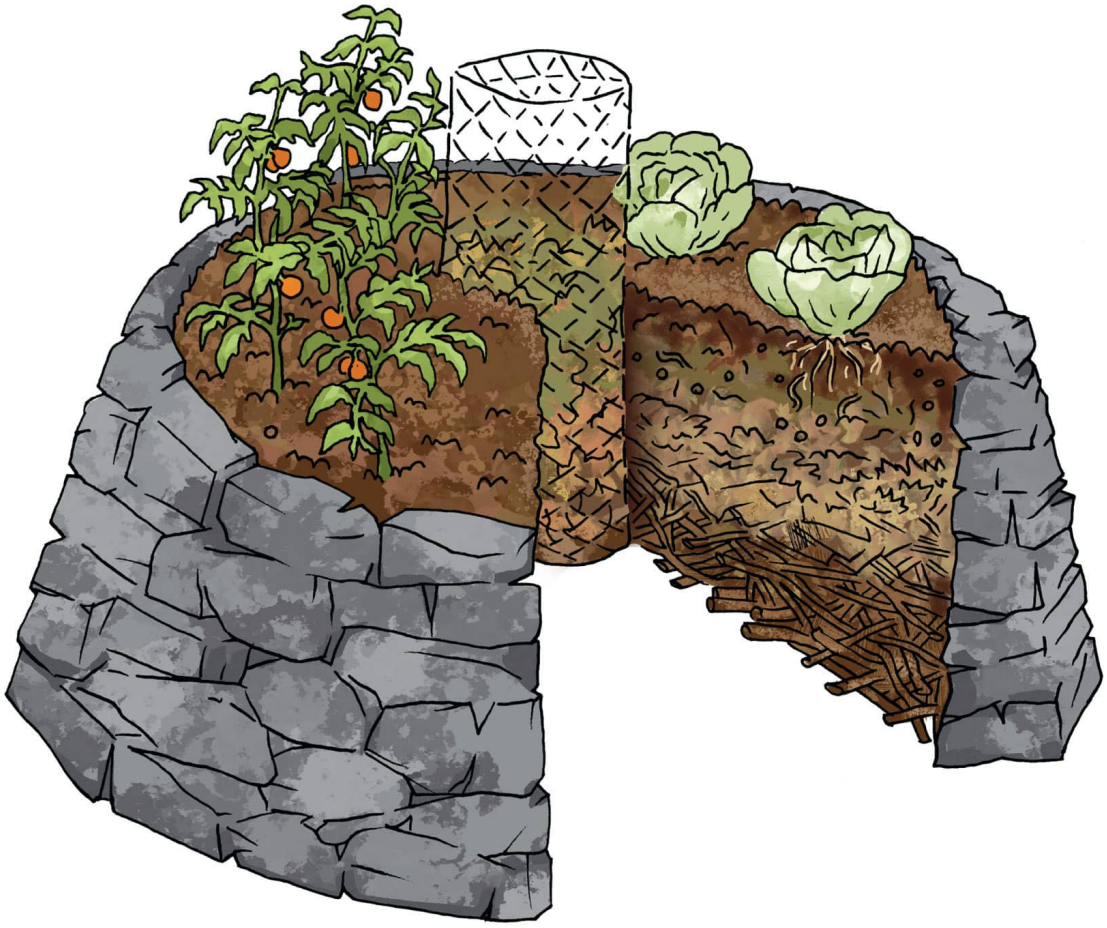
potatoes, beans, peas, and root crops. In subsequent years, this will not be an issue.

Once the bed settles and the wood starts decomposing, use your hügelkultur mound as you would any raised bed. Amend the top before each planting with a thin layer of compost, and plant away. Sprinkle seeds on top of the layer of compost. For transplants, dig a small hole in the mound, add compost, and plant. Vine crops, such as squashes, pumpkins, melons, and gourds, grow well on a hügelkultur mound, especially in the first year when the mound's slopes are steep. They cover the entire mound with foliage come late summer, helping prevent erosion. I've even seen gardeners grow shrubs and trees on their hügelkultur mound. Just make sure the mound is placed where it gets enough light for the plants you're growing.

You can also combine a hügelkultur bed with a straw bale garden bed. You can edge the hügelkultur bed with straw bales. The bales help keep the hügelkultur bed in place the first year. As the straw bales rot, they provide compost for the bed in subsequent years. All this helps rejuvenate the soil and allows you to grow healthy vegetables, herbs, and flowers.

## Keyhole Gardening

Raised-bed gardening works in many locations for improving production and water drainage. In wet or dry areas, you can adapt raised beds to the local climate and conditions. Keyhole gardening is a raised-bed adaptation that works well in dry areas. These gardens need less water, allowing you to grow productive vegetables, herbs, and flowers using no-dig methods, even in areas with little rainfall.



*This cut-away illustration of a keyhole bed shows how layers of organic matter are are added to fill the bed before planting. Note the compost bin cylinder at the center.*

Keyhole gardening is a perma-culture technique where you make a C-shaped bed and cut a path into the center of the bed instead of having straight beds lined up. The benefits of designing your bed like a keyhole are many. First of all, you create more planting space and devote less space to paths. Compared to a typical straight raised-bed system, a keyhole bed uses about one-half as much space in paths. This design is great for small-space gardeners looking to maximize the room they have to garden. Like all no-dig systems, once established, keyhole beds don't disrupt the natural soil structure and ecosystem. Keyhole beds are raised 1 to 3 feet (30 to 90 cm) tall, depending on the system of soil building you're using (more on that later). The taller keyhole garden beds have some very specific benefits and are often used in dry areas because they have more mass to hold more water. But they also are good in wet areas since they shed excess moisture.

Tall beds are easier to work because you don’t have to bend over as much. They also have fewer animal and pest problems because they’re elevated.

*A keyhole garden is a garden of a different shape. By wrapping the beds around a “keyhole” notch, this design reduces pathway space and makes for easier gardening.*

*Keyhole beds are often designed with a small compost "bin" at the center. You can easily walk into the keyhole to deposit kitchen scraps or yard debris and create compost right in the bed.*

## BUILDING A KEYHOLE BED

The basic design of the keyhole garden is simple. Measure out a 6-foot (1.8 m) diameter circle in a location with adequate sun for what you'll be growing. Decide how tall you want the bed to be and what shape will work best. The shape will be determined somewhat by the materials you'll be using to frame the bed. Wooden frames work great for rectangular and square beds, but it's difficult to make the C-shape of a keyhole garden with wood. Stones, cement blocks, and bricks are easier to curve. For beds less than 1 foot (30 cm) tall, rot-resistant woods are common, but you can use any of the materials I've mentioned previously. For taller keyhole gardens, up to 3 feet (0.9 m) tall, reinforced wood can work, but often stones, bricks, or cement blocks are sturdier. They can also be mortared together to make a more permanent structure, or they can be simply stacked. These materials hold the soil in place and maintain the moisture in the soil better. They also keep the soil cooler in hot-summer areas.

Build the bed so its center is no more than 3 feet (0.9 m) away from any bed edge. This will make it easy to reach plants without stepping on the soil. Build a 3-foot-long and 18-inch-wide (0.9 × 0.4 m) pathway into the center of the circle. The outside edge of the pathway should be a bit wider than the entrance. From the air, the bed should look like a keyhole, or a donut with a slice taken out!

*African keyhole beds are often raised, made with local materials, and use a compost bin in the center of the bed to add water and nutrients to the plants.*

Once constructed, you'll have two options for filling the built bed. Both are no-dig methods. For low beds, layer moistened cardboard or newspaper on the bottom to stop weed growth, and then fill the bed with compost. For taller beds, or if compost isn't readily available, add wet cardboard and layer it over the existing soil in the bed and along the insides of the walls as well. This will help preserve soil moisture and contain the soil. Add a layer of branches on the bottom of the bed to help with air flow. Then follow the organic material layering technique described on page 31, mixing brown (high-carbon) and green (high-nitrogen) materials in the bed, watering each layer, until it's filled. See page 36 for examples of brown and green organic materials. Cap the top of the pile with a 6-inch (15 cm) layer of compost. Slope the compost, so the center of the bed is a little higher than the sides. This helps the water flow to the bed edges in wet areas. You can plant in the bed immediately after building, since the compost will feed the plants as the organic materials decompose.

## OUT OF AFRICA

Other than the keyhole shape, so far this bed looks like any raised bed you may have made. But there's more to the keyhole bed than just a unique shape and tall walls. The story starts in Africa.

In rural Africa, not only is lack of water an issue, but fertile soil is also at a minimum. Villagers and non-profit organizations working there came up with a keyhole bed design that addresses both issues. The keyhole beds are tall and made out of stone or cement blocks. Tall beds hold water better and provide longer-term fertility to the bed. Villagers have to use whatever organic materials are available to build the soil layer. They pile sticks, dried grasses, old leaves, kitchen scraps, and animal manure in the layers to build the soil. All these materials will eventually break down into compost-rich soil. In other areas where cardboard, newspaper, and non-glossy black and white paper products are readily available, the layers can include a mix of these recycled materials.

*When installing a new keyhole bed, line the sides and bottom with moistened cardboard or newspaper before filling the bed with layers of organic matter.*

*The compost bin in the center of this tall keyhole bed is a 1-foot (30 cm) diameter cylinder where kitchen scraps and other organic waste materials are added. The bed is watered through the compost bin too, spreading moisture and nutrients to the plants.*

The biggest difference between the keyhole beds I've described so far and the ones started in Africa is the incorporation of a compost system into the bed. With fertile soil at a premium in these dry areas, integrating a compost system right into the bed is a way to feed the plants while composting at the same time. Here's how it works.

*Rather than building your own keyhole garden bed, you can also purchase a pre-fabricated keyhole bed to install in your garden.*

Build the compost pile at the center of the bed where the pathway ends. When building the bed, inside the bed wall, construct a 1- to 2-foot (30 to 60 cm) diameter cylinder made from sturdy chicken wire or hardware cloth. Overlap the ends and tie them together. Place a layer of wood chips or larger pieces of wood on the bottom of the cylinder to aid water drainage. Then build the compost layers around it as described previously. You may have to support the empty compost cylinder with wooden stakes as you fill the bed, so it doesn't collapse from the weight pressing on it. Make sure the

top of the cylinder is about 1 foot (30 cm) above the top of the soil line in the beds.

Then start adding kitchen scraps, chopped leaves, dried grass, manure, wood chips, shredded paper, and other materials into the compost cylinder. Try to create a brown/green mix that will decompose properly, adding water as needed as described on page 68. Cover the top of the compost cylinder with a board or block to keep it from drying out or getting too wet from storms. Instead of watering the whole bed, simply pour water into the compost cylinder. Since the cylinder walls are open, the water will drain out into the garden bed. The organic materials will start decomposing, and the water will help move the nutrients from the center compost bin out to the edges, feeding the whole bed. This composting method, combined with the decomposing organic materials in the 3-foot (0.9 m) tall bed, will feed the plants growing on top. It's that simple.

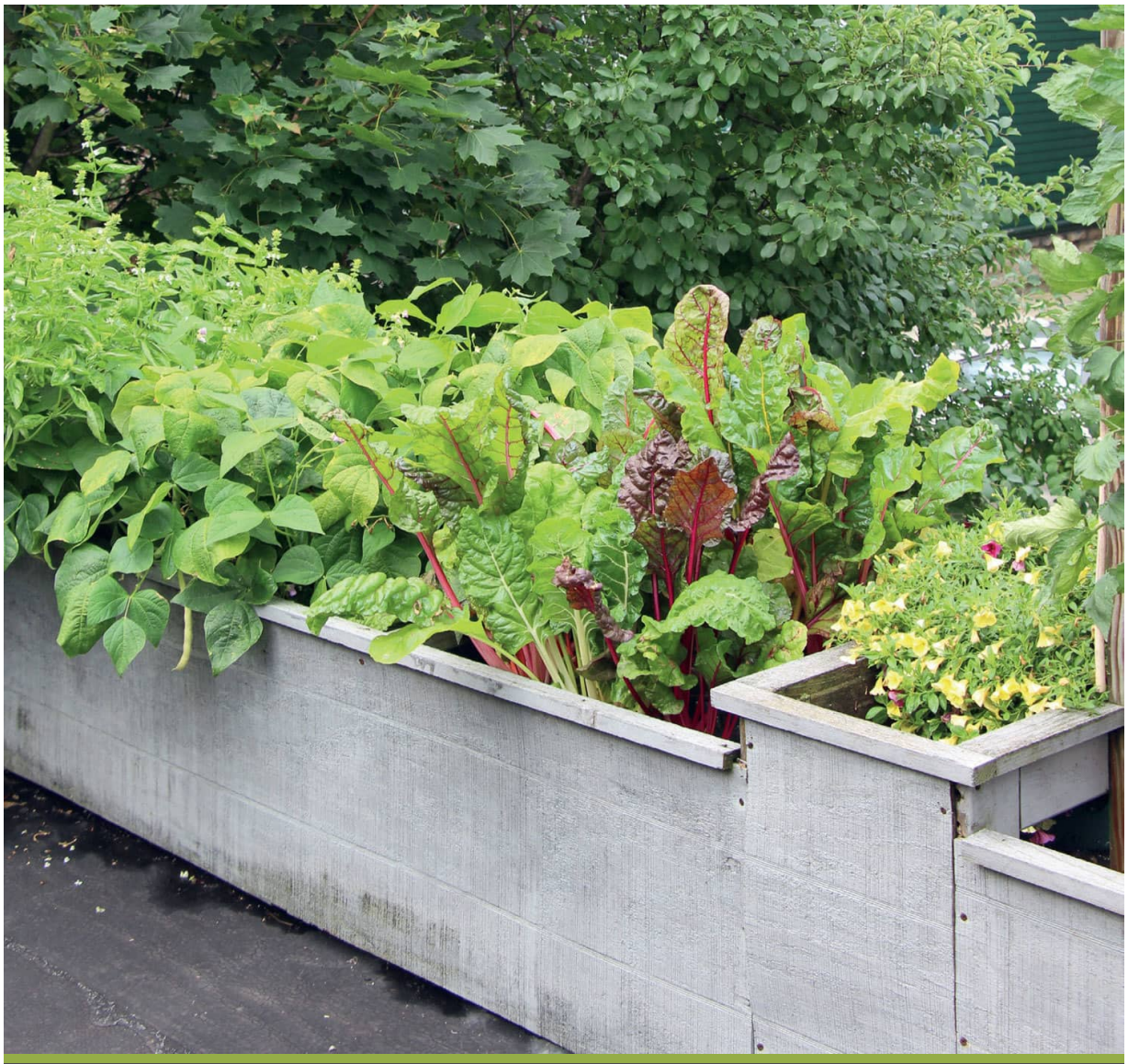
## MAINTAINING A KEYHOLE GARDEN

Plant a variety of vegetables, herbs, and flowers in your keyhole garden. If the bed is oriented north-south, plant tall crops on the north side and shorter ones on the south side. This planting design will create a protective microclimate for the shorter plants up front.

If you build these beds in a curved shape, they'll lend themselves easily to the broadcast seeding and polyculture planting designs described in chapter 5. With all the compost and decomposing materials, even large plants will thrive the first year. Some gardeners even use keyhole beds to grow shrubs and small trees.

Keep the beds well-watered through the compost cylinder. Each year, clean out the finished compost in the cylinder and lay it on top of the beds. Start refilling the compost cylinder even before you begin planting to give the decomposition process a jump start. Also, add a layer of more organic materials topped with compost to the planting area before planting to bring the level of the soil up to the rim of the bed. With all that organic material in the bed, it will surely settle over time.

Go to page 122 to find more resources about straw bale gardening, hügelkultur beds, and keyhole gardening.



*Chapter 7*

# CONTAINERS—THE ORIGINAL NO-DIG GARDEN

> *You can have an attractive container filled with vegetables and flowers using no-dig principles to keep them growing strong.*

So far, I've focused this book on no-dig gardening in the ground and using some special techniques such as straw bale and hügelkultur gardening. But many gardeners live in areas where any type of in-ground gardening isn't possible. Also, some gardeners would like to downsize their gardens, not expand them. Even though no-dig gardening is less work than traditional gardening, sometimes it's still more than they're willing or able to tackle. The solution for both groups of gardeners is container gardening.

You might think it's a bit of a stretch to talk about no-dig gardening in containers. After all, isn't one of the points of no-dig gardening to enhance the natural fertility and ecological life in the soil? Container garden soil is inherently a human-made creation. Container soil mixes are made up of many things, but not garden soil.

However, there are ways to bring no-dig principles into your container garden. Because we now know the importance of soil life, structure, and organic material composition, we can apply those same ideas to our container soil mix. By adding compost, organic materials, and organic fertilizers to the soil mix—even if there's no actual soil in it—we can mimic the activity that happens in the soil of a no-dig garden with similar fabulous results. As always, it all starts with the soil.

# Soil Mixes

There has been a revolution in container gardening over the past few decades. As more and more gardeners turn to containers to grow food and flowers on decks, patios, balconies, and porches, garden product manufacturers have responded to this surge in container interest with new and more unique containers. I'll dive into this pot culture in a bit. But there has also been an evolution in thinking about the soil mixes used to fill containers.

The old way of thinking about potting soil was to create a soilless mix made of specific materials that fit a plant's needs. Add peat moss for water retention and structure for roots to grow. Add volcanic and mined materials, such as perlite and vermiculite, for water drainage and nutrient retention. Add chemical fertilizers to feed the plant. While this basic recipe works, gardeners have found that, just like in a no-dig garden, organic materials are critical to soil and plant health even when growing in containers. Compost, organic fertilizers, and other organic materials work well in a container mix to fit the needs of plants and provide better growth and production. Even though the soil is in a container, the same natural processes of soil life still make nutrients more available and help with water drainage and retention.

*By using an organic soil mix with compost, plants—like this compact watermelon—will grow better, and maintaining the container will be less work.*

But before we just go off willy-nilly adding materials like compost, leaf mold, and decomposed bark chips to our containers, we should first understand the basic soil mixes on the market.

The variety of potting mixes available for containers has exploded. There are transplanting mixes, seed-starting mixes, specialty plant soil mixes, organic mixes, soil mixes with time-release fertilizer, soil mixes with mycorrhizae, soil mixes for self-watering containers, soil mixes with wetting agents (additives that help water penetrate the soil easier), and so on. It can get very confusing when deciding what mix to use in your container. So, let me try to simplify the whole container soil issue by

grouping these mixes into three categories: seed-starting mixes, specialty plant mixes, and potting mixes.

The basic rules of use are:

- Use seed-starting mixes when growing new plants from seed.
- Use specialty plant mixes for particular plants with very specific needs, such as cacti and orchids.
- Use potting mixes for everything else.

## SEED-STARTING MIXES

These mixes are specially formulated so seeds can easily germinate and young seedlings can grow. They are lightweight and hold enough water to help with germination, but they drain well so seeds don’t rot. These mixes contain mostly milled peat moss or coir (recycled coconut husks), so the material is light and fluffy. Depending on the recipe, perlite, vermiculite, compost, and coarse sand are added to help with water drainage and nutrient retention. These mixes get your young seedlings off to a good start.

*Growing in beautiful containers on your deck or patio is easier now when using a variety of potting soil mixes adapted to certain plants and pots.*

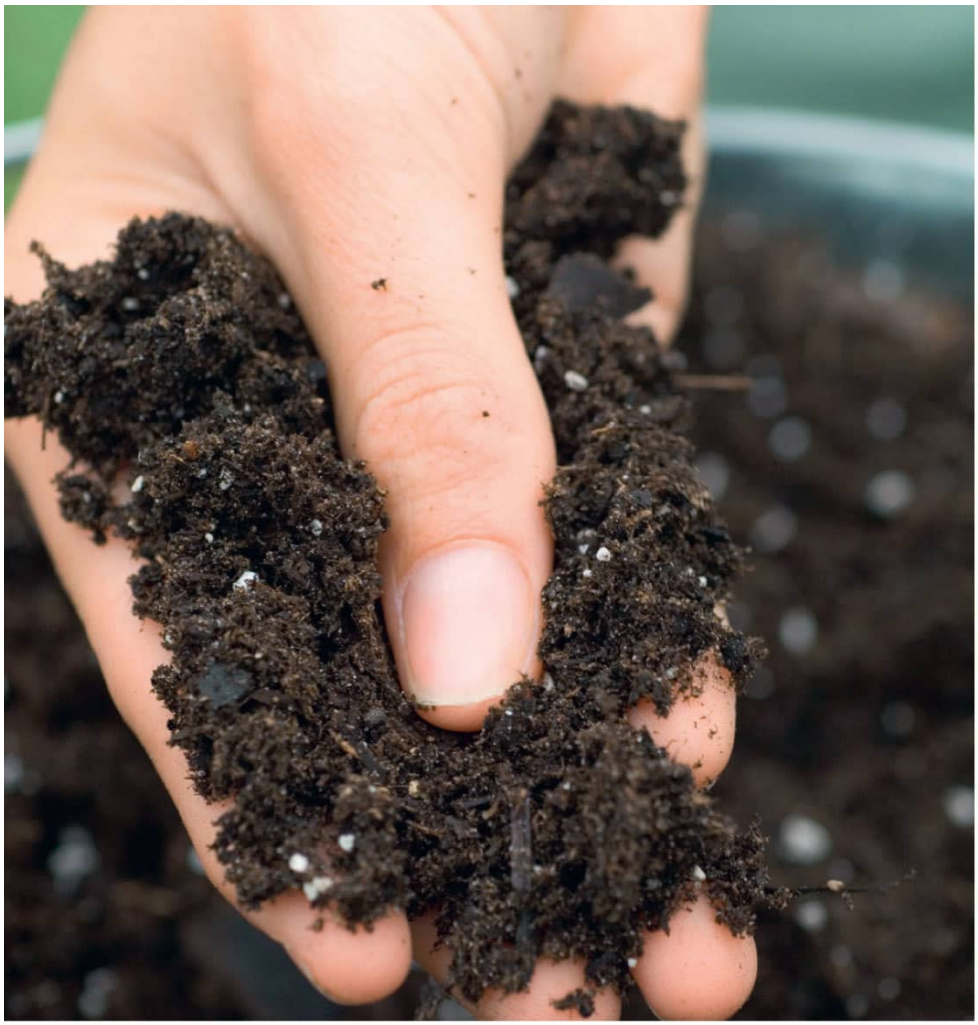
## SPECIALTY PLANT MIXES

There are many different types of specialty plant mixes on the market. These mixes have special ingredients important for the needs of particular plants. For example, cacti and succulents need very well-drained soil. As a result, specialty plant mixes tailored for them have more inert ingredients such as coarse sand and rice hulls. Orchid mixes may be primarily made of tree bark with added charcoal.

## POTTING MIXES

These mixes contain the essential ingredients of peat, coir, perlite, vermiculite, and sometimes crushed limestone (lime), but other materials are added for healthy plant growth. Organic potting mixes often contain compost, organic fertilizers, and/or mycorrhizae fungi to enhance plant growth. Other potting mixes may use time-release chemical fertilizers to feed the plants. These synthetic fertilizers don’t benefit the soil life, and no-dig gardeners usually avoid them. Organic potting mixes work well to grow annual and perennial plants, shrubs, and trees.

For a no-dig gardener, organic potting mixes are the way to go for most containers. They almost always contain compost, and you know how much I love compost. They also provide the organic materials that will break down and feed the soil creatures and plants.



*Potting soil is specially blended to provide good water retention and drainage, nutrients, and anchorage for roots to keep plants upright and strong.*

Most of these organic potting mixes have the necessary nutrients for your plants to flower and produce. However, you may have to supplement an organic potting mix depending on what you're growing. If you're just transplanting vegetable, herb, and flower seedlings you started indoors into larger containers, your basic seed-starting mix should be fine for getting your transplants ready. Once in their final container, use an organic potting mix with organic fertilizers already added like those mentioned in the chart on pages 94 and 95. If you're growing perennials, trees, and shrubs, look for a mix with more sand, compost, and composted bark chips in the mix to increase the organic matter, make for better water drainage, and prevent soil compaction. You'll have to fertilize containerized perennial plants regularly to keep them growing strong.

## Make Your Own Mix

There are many good organic soil mixes on the market that use high-quality ingredients for your container plants to thrive. By using bagged potting mixes that include materials such as compost, bark chips, and granular organic fertilizers, you enhance the soil life in the container, resulting in better growth with fewer disease problems.

But you may not want to keep buying bagged soil mixes, or maybe you'd like to experiment with making your own potting mix. If you are growing lots of plants in containers, bagged potting soil can get expensive. It may be cheaper to buy the ingredients separately and make your own mix. There are many recipes available for a basic organic potting mix. Before we dive into making a mix and looking at recipes, it's good to define the different ingredients in an organic soil mix. I highlight the most common ingredients in the chart beginning on page 94.

*Check your potting soil bags for a list of ingredients. Organic potting soil will often contain compost and other organic fertilizers to provide a good balance of nutrients for your plants.*

*Potting soil contains a mixture of ingredients, such as peat moss, coir, perlite, and compost. Knowing why each of these materials is used in potting soil helps you understand what your plants need to thrive.*

## What's Mycorrhizae?

You may see the term *mycorrhizae* listed on bags of potting mix. This is the name for a group of naturally occurring fungi that attach to plant roots and enhance the plant's ability to take up nutrients and water. In nature, there are miles of this fungus in the soil, forming a massive network and working as a key player in the soil's ecology. Mycorrhizae are added to potting mixes with the hope that they will mimic what happens in nature and help your container plants grow stronger.

While this is a great idea, there are some reality checks. There are thousands of types of mycorrhizae that work with many different plants. When adding mycorrhizae to your container, you may not have the type suited to the plants you're growing. Also, mycorrhizae can easily be killed by heat, so if your container gets too hot, you may not get a bonus effect. Mycorrhizae also help with water and nutrient uptake, but if you're watering and fertilizing your container regularly, you negate any benefit of having the mycorrhizae. So, should you shun mycorrhizae? I'd suggest not buying separate mycorrhizae to add to your potting mix, but if you have the choice to buy organic potting soil containing mycorrhizae, go for it. You have nothing to lose, and these fungi may help your plants.

## Typical Organic Soil Mix Ingredients

| INGREDIENT | COMMENTS |
|---|---|
| **Peat Moss** | Probably the most common ingredient in potting soil mixes. Sphagnum peat moss is a harvested natural material. It holds 15 to 30 times its weight in water. It's acidic, so lime is usually added to the mix to bring the pH closer to neutral. Peat moss is also hydrophobic (repels water), so it can be hard to moisten. Chemical wetting agents may be added to help. Look for organic peat moss that uses yucca as a natural wetting agent. |
| **Compost** | A main component of organic mixes. Use finished compost. Screen the compost to remove chunky materials. Worm castings or vermicompost also work well. Worm castings are more nutrient-dense than other composts and can help with disease prevention. Don't use garden soil. |
| **Coir** | Made from recycled coconut husks, coir is often used with or as a replacement for peat moss. The main advantage of coir over peat moss is coir is hydrophilic (absorbs water), so it's easy to wet but also dries out faster than peat moss. It's also a recycled product with fewer negative environmental effects when compared to peat moss. It has a higher pH than peat, so it needs less lime in the mix. Wetting agents aren't needed. |
| **Perlite** | Made from heated, crushed, volcanic rock, perlite is used solely to aerate the soil mix, making it lighter and helping water drain better. Wear a mask when working with perlite since it can be very dusty. |
| **Vermiculite** | Made from a heated, mined silicate, vermiculite helps the soil mix retain moisture and hold nutrients. Use fine-grade vermiculite for seed-starting mixes and coarser-grade vermiculite for potting mixes. Wear a mask when working with vermiculite since it can be very dusty. |
| **Composted Bark** | Primarily used in soil mixes for perennials, trees, and shrubs, composted bark helps hold water, enhance soil biological activity, and keep the soil mix aerated. You may need to add a nitrogen fertilizer to counteract bark's tendency to tie up nitrogen in the soil the first year. |
| **Sand** | Not as commonly used as perlite and vermiculite, coarse builder's sand enhances water drainage and adds bulk to the soil mix for larger plants. |
| **Limestone** | Used to counteract the acidifying effects of a peat moss–based soil mix. Dolomitic lime works best for adding calcium and magnesium |

| | |
|---|---|
| | to the soil. Use finely ground limestone and wait two weeks before planting to allow the limestone to work. |
| **Organic Fertilizers** | Organic soil mixes contain a wide range of organic fertilizers. I recommend using a mix of these fertilizers to provide balanced nutrients in the container. The simplest is a premixed, balanced granular organic fertilizer. To make your own mix, look for medium- to fast-acting products. For a nitrogen source, use blood meal or fish emulsion. For a phosphorus source, try bone meal or fish meal. For a potassium source, try bird or bat guano or soybean meal. |

> *Note: You'll notice I don't include garden soil in the list of potential ingredients. Garden soil does carry useful microorganisms and nutrients, but it also can foster diseases. And garden soil can be dense, making it hard for water to drain and roots to penetrate. It's better to use finished compost to get the benefits of the microbes without the problems of disease and heaviness of garden soil.*

# Potting Soil Recipes

As I mentioned earlier, I place potting mixes into three main categories. One for seed starting, one for specialty plants, and one for potting and growing transplants to maturity. There are many recipes for making each of these mixes.

Since specialty plant mixes contain unique features necessary for each specific type of plant, I think it's easiest to purchase premade specialty potting soil for those plants. If you're only starting a few plants from seed in winter, the same may be true of seed-starting mix. However, I do offer two organic seed-starting mix recipes here along with an organic potting mix.

### BASIC ORGANIC POTTING MIX

- **2 gallons (1.6 kg) sphagnum peat moss or coir**
- **2 gallons (2.8 kg) vermiculite**
- **1 gallon (1.7 kg) finely screened compost**
- **2 tablespoons (28 g) granular, balanced, organic fertilizer**

» **3 tablespoons (120 g) ground limestone (if using peat moss)**

*Seed-starting soil mixes are meant to get your germinating seedlings off to a good start. They are perfect for growing seedlings for a few months before moving them into the garden.*

Seed-starting mixes differ from organic potting mixes in that they are designed to keep the soil light, with a perfect blend of water retention and drainage. They often have enough nutrients available for a month or so of growing, since the seedlings will be transplanted either into a larger pot or directly into the garden. One of the standard recipes for commercial growers is the Cornell seed-starting mix. This mix features peat, perlite, and fertilizers for early plant growth. I've added an organic adaptation of the Cornell mix here, as well as another popular organic seed-starting mix that features compost. Try these mixes when growing seedlings indoors.

### ORGANIC SEED-STARTING MIX

- **2 parts screened compost**
- **2 parts milled peat moss**
- **1 part wetted vermiculite**

The compost helps neutralize the acidic peat moss. If the soil stays too wet for your seedlings, consider replacing the peat moss with coir, adding perlite, and reducing the quantity of compost.

### CORNELL SEED STARTING MIX (ORGANIC ADAPTATION)

- **3 cubic feet (0.08 $m^3$) peat moss or coconut coir**
- **3 cubic feet (0.08 m3) perlite**
- **2½ pounds (1.1 kg) bone meal**
- **1½ pounds (680 g) ground limestone**
- **1½ pounds (680 g) blood meal**

This mix gives you a few months of growing without the need for additional fertilizer.

## Choosing Your Pot

As with soil mixes, container selections have vastly expanded over the years. When I was a budding horticulturist, the pot choices were clay and green or white plastic. That was about it. Now, with the container revolution in full swing, there are many different types of containers to grow plants. These materials are sometimes unique and add flair to a deck, patio, or balcony. You can even mix and match outdoor furniture, house siding, and flooring with various colored and textured containers. The pots themselves are worthy of notice even without the plants. But we’re gardeners, so we want plants—lots of them! With these new container materials, we can match the right plants with the right type of container for better growth. Let’s take a look at some pot options.

*You can grow healthy plants in containers made from a variety of materials such as clay, fiberglass, ceramic, wood, and even fabric.*

## Matching Your Pot with Your Plant

| CONTAINER | DESCRIPTION | PLANT OPTIONS |
|---|---|---|
| **Terracotta** | Clay is attractive and breathes, so dries it out fast. It's fragile and breaks if left outdoors in winter in cold climates. | Grow plants that like a drier soil such as thyme, oregano, rosemary, beans, geraniums, and portulaca. |
| **Ceramic** | Very attractive. Holds water better than clay but dries out faster than plastic. May or may not have a drainage hole in the bottom. It will break if left outdoors in winter in cold climates. | Plant choices are similar to those for clay pots, but since it holds water better, it works well for plants that need more consistent moisture, such as basil, lettuce, coleus, and impatiens. |
| **Galvanized Metal** | Very chic. This material doesn't rust, lasts for years, and holds moisture. The soil gets very hot in full sun, so grow the right plants or provide some afternoon shade. | Grow heat-loving plants such as okra, sweet potatoes, watermelons, lantana, verbena, and hot peppers. |
| **Fiberglass and Resin** | These pots are molded to look like terracotta, metal, or even wood. They are lightweight, durable, and UV stabilized. They can be left outdoors year-round in a cold climate. These often are sold as self-watering pots, having a reservoir to hold water in the bottom. | Because they have the qualities of a plastic pot, most any vegetable, flower, and herb that needs a consistent supply of water will grow well in these pots.<br>These are also good containers to use for perennial flowers, trees, and shrubs. |
| **Wood** | Select wooden containers made from rot-resistant woods such as redwood. Old wine or whiskey barrels work great. These can be heavy when filled with soil, but they hold water well. | Large half wine barrels are perfect for large plants such as tomatoes, eggplant, squash, canna lilies, and tarragon. They work well for mixing and matching different plants together, such as swiss chard, lettuce, petunias, and oregano. |
| **Grow Bags** | This fleece-like material comes in many shapes, sizes, and colors. The containers are lightweight and have handles to easily move them | Large grow bags are well suited for tomatoes, peppers, squash, and potatoes. Smaller bags are perfect for |

| | | |
|---|---|---|
| | around. They breathe like clay pots but hold moisture better. They're easy to store. Remove the soil, fold the bags, and stack in a small closet. | salad greens, cascading flowers, and herbs. |

*Metal containers are hot–figuratively and literally. They are attractive and durable but can heat up the soil too much for some plants.*

*Grow bags are fabric containers that hold water and breathe, making them perfect for many plants. The best part of grow bags is when you're finished using them in fall, you can simply compost the potting soil, wash them, and fold them to store.*

## What to Grow?

Now that you have the containers and your organic soil mix figured out, it's time for the fun stuff. There are many ways to approach growing vegetables, herbs, and flowers in containers.

- You can plant just one type of plant per container. This works particularly well with large plants such as tomatoes, canna lilies, and lovage.
- You can plant containers featuring all veggies, herbs, or flowers, or integrate these together.
- You can mix and match plants based on their growth styles.

- The classic thriller, filler, and spiller technique places a tall plant in the middle of the container (the thriller), mounding plants around the base of the tall plant (the fillers), and cascading plants along the edge (the spillers). This maximizes the amount of plant material you can grow.
- You can plan out succession plantings based on the season. Start with cool-season-loving vegetables, herbs, and flowers such as pansies, arugula, green onions, and cilantro. With the hot weather of summer, replace these plants with bush beans, basil, and bush zinnias. Come fall and winter with cooler weather, plant kale, primula, and parsley. In this way, one container can provide a variety of food and flowers for you almost year-round depending on where you live.

Just as garden manufacturers have created all types of containers and soil mixes, plant breeders have responded to the surge in container interest by creating more dwarf varieties. In the flower world, there are dwarf versions of popular annuals such as cosmos, sweet peas, and zinnias. Plus, there are many naturally dwarf annual flower selections to grow. The real change has occurred in the vegetable and herb world. You can now grow just about any vegetable or herb in a container with the right pot and the right variety. The sidebar on the next page lists some of the dwarf varieties of vegetables and herbs to try in containers.

## Taking Care of Your Containers

There are many resources for how to water, fertilize, and protect your plants in containers. The key is to remember containers are an artificial growing environment. As a result, they will need special attention to keep plants healthy.

# The Best Vegetable and Herb Varieties for Containers

Some vegetables and herbs are naturally small and easy to grow in containers. For example, you can grow almost any variety of arugula, radish, parsley, thyme, bok choi, microgreens, and bush bean in your pot. For larger vegetables and herbs, here are some good dwarf choices to try.

**Basil—**‘Spicy Globe’, ‘Prospera Compact’

**Beet—**‘Cylindra’, ‘Babybeet’, ‘Little Ball’, ‘Bull’s Blood’

**Broccoli—**‘Sun King’, ‘Waltham 29’, ‘Small Miracle’

**Carrot—**‘Little Finger’, ‘Thumbelina’, ‘Short N Sweet’

**Chives—**‘Growlau’

**Cilantro—**‘Pot Cilantro’

**Cucumber—**‘Salad Bush’, ‘Bush Pickle’, ‘Spacemaster’

**Dill—**‘Fernleaf’

**Eggplant—**‘Bambino’, ‘Patio Baby’, ‘Fairy Tale’

**Hot Pepper—**‘Thai Hot’, ‘Super Chili’, ‘Black Pearl’

**Lettuce—**‘Little Gem’, ‘Deer Tongue’, ‘Tom Thumb’, ‘Newham’

**Okra—**‘Baby Bubba’, ‘Dwarf Long Green Pod’, ‘Candle Fire’

**Onion—**‘Italian Scallion’, ‘White Bunching’, ‘Red Torpedo’

**Oregano—**‘Compact’

**Peas—**‘Sugar Ann’, ‘Dwarf Grey Sugar’, ‘Strike’

**Rosemary—**‘Blue Boy Dwarf’, ‘Prostrate’

**Sage—**‘Dwarf Sage’

**Summer Squash/Zucchini—**‘Astia’, ‘Gold Rush’, ‘Sunburst’, ‘Pic N Pic’

**Sweet Corn—**‘On Deck’, ‘Trinity’, ‘Golden Bantam’

**Sweet Pepper—**‘Jingle Bells’, ‘Mohawk’, ‘Redskin’

**Tomato—**‘Lizzano’, ‘Tiny Tim’, ‘Better Bush’, ‘Rosella Purple’, ‘Dwarf Sweet Sue’

**Winter Squash—**‘Cornell Bush’ delicata, ‘Table Queen’ acorn, ‘Butterbush’ butternut, ‘Gold Nugget Bush’ buttercup

*There are even tomato varieties, such as ‘Lizzano’, bred to not only fit easily in a small container, but also to produce fruits all summer.*

## Self-Watering Pots

Probably the most useful invention in the container world is the self-watering pot. No longer are we obligated to water containers, window boxes, hanging baskets, and railing planters twice a day in summer. The concept of the self-watering pot is simple. These durable, plastic resin containers have a false bottom. Underneath the false bottom is a reservoir where water is stored. There are holes or wicking materials in the false bottom that allow the water to move by capillary action (remember high school physics?) from the reservoir into the dry potting soil. Depending on the size of your self-watering container, you can go days without having to water, even in summer. Of course, you'll have to check the reservoir regularly and refill it, but being able to go to the beach on a summer weekend without having to worry about your container drying out is freeing! Many self-watering containers also have drainage holes so a sudden thunderstorm won't flood the container.

*A self-watering pot has a false bottom and a water reservoir underneath so water can migrate, through capillary action, into the soil mix, keeping it moist for days.*

## WATERING

Watering is one of the most important activities to keep your pots looking great. Matching the plants with the right type of container will help as well. Self-watering containers minimize watering irregularities due to busy schedules or forgetfulness. But even so, consistent watering is important. Drip irrigation and soaker hoses on timers also reduce the amount of remembering you'll have to do. When watering by hand, remember the finger test. If you can poke your finger into the soil and it's dry to the knuckle, it's time to water. On sunny, windy, or hot days, you may be watering a few times a day, especially with smaller containers. Of course, the larger the container, the longer you can go between waterings.

## FERTILIZATION

Use organic soil mixes with fertilizer added to reduce the amount of supplemental fertilizing you'll have to do in your containers. That being said, you might have to add some supplemental fertilizers during the growing season for specific deficiencies. The nutrient deficiency I notice most in containers is nitrogen, especially with younger plants. The plants take on a yellowish cast, particularly on the older leaves. Adding a highly soluble, liquid nitrogen fertilizer, such as fish emulsion or compost tea, can quickly resolve the problem. Also, if you are succession planting in your containers, with each change of plants, add more organic fertilizer and compost to the pot before planting the next round of plants.

*To reduce the maintenance of your container garden, use organic potting soil to retain more moisture and install drip irrigation or soaker hoses placed on a timer to water plants regularly.*

*Organic potting soil mixes have compost and organic fertilizers already in them. However, especially for young plants, you may need to add a nitrogen boost in spring to get them off to a good start.*

## No-Dig Layers in Containers?

If you're making your own organic potting mix, you might want to experiment with using the no-dig layering techniques in your pot. Layering materials in a container isn't that different from layering them in the garden. There are just a few alterations. It's best to use a large container, such as one that's 20 to 24 inches (51 to 61 cm) in diameter, to do your layering. For smaller containers, it's best to simply use the organic potting mixes I mentioned earlier in the chapter. Place a 2- to 3-inch (5 to 7.5 cm) layer of bark mulch on the bottom of the container to cover the drainage holes and help prevent any soil from leaching out when watering.

When building your no-dig layers in a pot, stick with finely chopped materials that decompose quickly. Compost, peat moss, coir, finely chopped leaves, and fresh, untreated grass clippings are best. Chunkier materials, such as straw, paper, and kitchen scraps, will take up space and take time to decompose. Create thin layers, alternating nitrogen (compost, fresh grass clippings) and carbon (peat, coir, chopped leaves) materials at 1- to 2-inch (2.5 to 5 cm) depths. To jump-start decomposition and release more nutrients in your container, add some organic fertilizer or worm castings in the compost layer. The castings alone will add nutrients to the plants, but if you add some worms too, they can help break down the organic material layers. Moisten each layer as you add it.

It's best to build the layers a few weeks before planting to allow them to settle and start breaking down. Once the pile settles, top the container with more compost and start planting. For perennial plants, simply add more no-dig layers each spring to keep the container growing strong.

## REUSING SOIL

One question I always get is: Can I reuse the same potting soil year after year? The answer, like so many things in life, is maybe. If your plants grew well all summer without many disease or insect problems, I would say yes, you can reuse it. As a precaution, scrape off the top 6 inches (15 cm) of soil and compost it. This is where diseases and insects may be hiding. Replenish the potting soil with more organic potting soil and mix it in well. If your plants struggled due to insects, diseases, or just poor soil, empty the potting mix completely and start anew. Sometimes plants struggle due to too much water or a compacted soil mix. Make sure your pots have adequate drainage holes and are elevated off the ground, even just a few inches, to be sure the water drains out well. Growing just one small transplant in too large a container or using a too-heavy potting mix can inhibit young plant roots from spreading out into the soil, and the plants may be stunted. Plant large, vibrant transplants in large containers and lighten your potting mix with additions of perlite, coarse sand, or composted bark to promote water drainage and air flow.

What should you do with that old potting soil you removed from your containers? Use it as a layer to create a new no-dig garden bed, of course! The compost, peat moss, coir, and other ingredients are fine to add as a layer. Even if there were diseases and insects in the potting soil, the process of decomposition neutralizes them.

## PROTECTING PLANTS

One of the beauties of container growing is portability. Most containers can be moved to find the ideal light depending on the time of year and to protect them from damaging winds and frost. For large, heavy containers, look for those with casters on the bottom or buy a plant caddy to move the pots around. You'll be able to find the right places to grow your plants based on the season and protect them from the weather. You can also use the space for other purposes, such as gatherings or as a play space for the kids, by rolling the pots aside. Casters and caddies work best on flat tile, concrete, and stone surfaces.

*Protect container plants from weather and easily move them out of the way by using pots with casters. Or get a plant caddie to wheel them around.*

Container plants generally encounter fewer pest problems. The soil is clean, and insects and animals may have a hard time finding your plants. Of course, there’s always the occasional insect that finds your garden oasis.

*To extend your growing season, put a lid on your container. You can buy or make a top to fit over your container, protecting plants from cold and wind.*

If pests, weather, or water stress do affect your plants, you'll have a decision to make. You can try to nurse along the struggling plants, cut them back dramatically, or start over. If you're using a succession method, it's probably easier to start anew with more plants. If it's pest-related, you may also want to replace the potting soil since the egg, larvae, or adult stage of the insect may still be in the soil. For favorite plants that can stand being cut back, prune them to a basic branch structure and let them grow again.

# Growing Fruit in Containers

Growing vegetables, herbs, and flowers in containers is a snap. But don’t feel like you’re limited to these smaller plants. Trees and shrubs can also be grown in containers too. There’s nothing like the taste of fresh apples, blueberries, or lemons grown in your small yard in a container. Or perhaps a beautiful ornamental shrub or tree would look great on your balcony?

The first step to growing a containerized tree or shrub is to select a dwarf variety. Plant breeders have created many dwarf versions of your favorite fruits and berries. For example, ‘El Dorado’ is a dwarf peach tree that only grows 5 feet (1.5 m) tall. ‘Blue Glaze’ is a dwarf blueberry that only reaches 2 to 3 feet (61 to 90 cm) tall. ‘Dwarf Meyer’ lemon can be grown to stay 6 feet (1.8 m) tall. Roses, boxwoods, and Japanese maples are just some of the other trees and shrubs that have dwarf selections. Select varieties adapted to your region and climate.

*With modern plant breeding, even berry bushes, such as blueberries, blackberries, and raspberries, will grow in containers.*

Then, choose a large container. The larger the container, the less work you'll have keeping the tree or shrub watered and growing strong. However, large containers filled with soil and plants are hard to move around, especially if you have to move them to protect the plants from the cold. In general, it's best to start with a smaller container (12 to 14 inches [40 to 36 cm] in diameter). Then, as the tree or shrub grows and needs more room, graduate up to a larger container (about 18 to 24 inches [46 to 61 cm] in diameter). You can use any clay, wooden, or plastic container. I like the new

fiberglass or resin plastic containers I mentioned earlier. Many of these look like clay or metal pots, but are rugged, withstanding cold and heat. Plus, they are UV resistant and are lightweight and easier to move around.

Add a mix of organic potting soil with compost or composted bark to your container. Also, look for potting mixes that contain mycorrhizae (see sidebar on page 93).

## CARE FOR CONTAINER TREES AND SHRUBS

Containerized trees and shrubs need special care. Place your potted tree or shrub in a sunny location, away from excessive wind or heat. Keep the soil well-watered using a drip irrigation system on a timer or by hand-watering regularly. Fertilize with the appropriate organic plant food for your plant. When the soil is dry 4 to 6 inches (10 to 15 cm) deep, add water until it drains out the drainage holes in the bottom of the pot. Add risers to the pot bottom to keep the planter off the ground, deck, or patio for better water drainage.

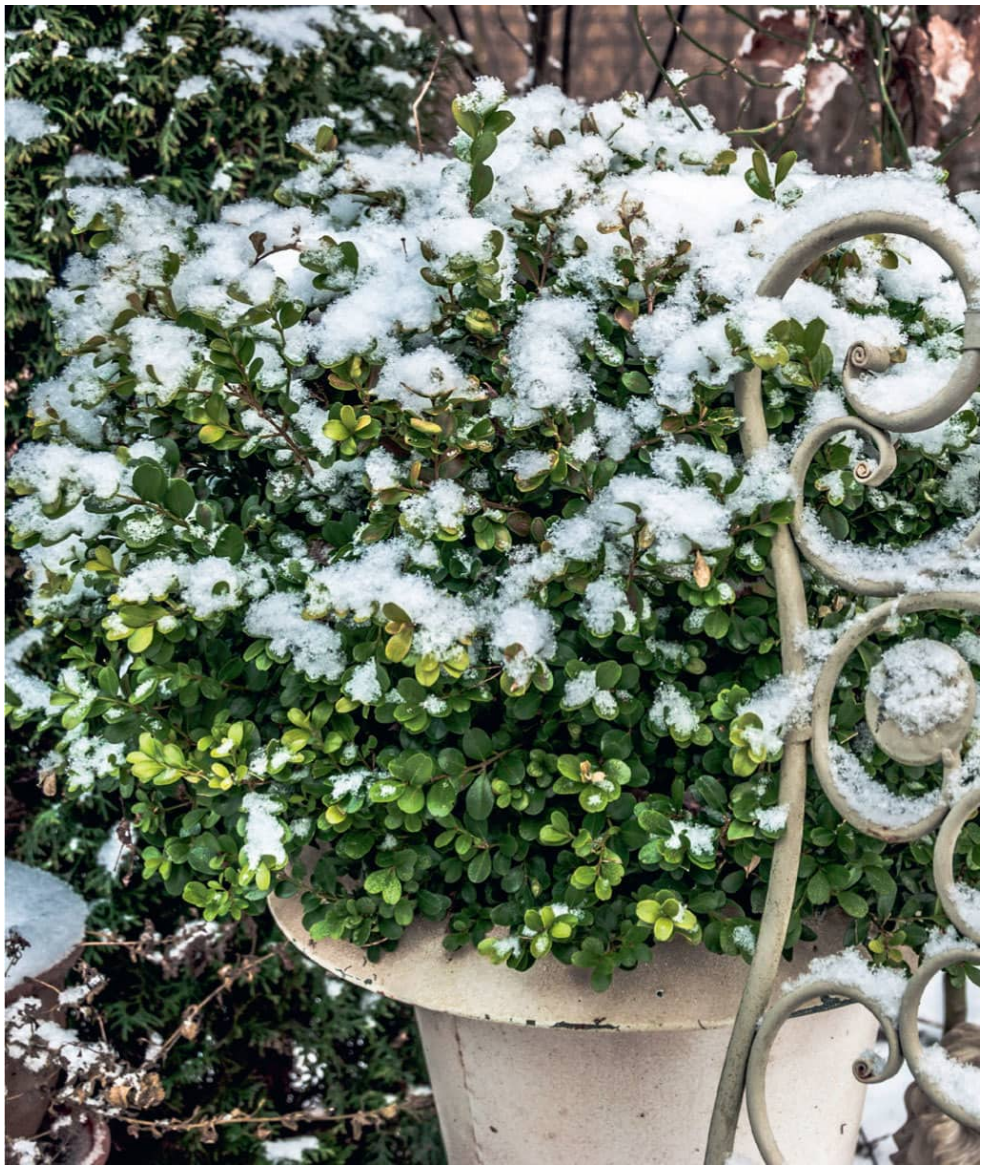
Each spring, check the container tree or shrub to see if the plant is root-bound (circling roots around the inside of the pot). Remove the plant from the container and, with a sharp knife or hand pruner, cut the circling roots and remove part of the root ball. Replant in the same container, adding new organic potting soil with compost and organic fertilizer.

Even if they aren’t root-bound, it’s good to repot your trees and shrubs periodically. Soil mixes will break down and start compacting, making it hard for water and air to flow. Repot with a mix containing fresh compost or composted bark to keep good air and water drainage. In general, mix 10 to 20 percent compost or composted bark into your tree or shrub potting mix if it doesn’t already contain it.

*Container trees require special care. Use an organic potting soil with compost or composted bark, root prune regularly, and protect the tree in winter in cold areas.*

In areas where the temperatures freeze in winter, move your deciduous container tree or shrub into a location that stays just above freezing, but no warmer than 50°F (10°C). A dark basement, garage, or shed is fine. The plant will drop its leaves and go dormant. The plant will automatically wake up in spring and start to leaf out, even indoors in the dark. Move the plant to

a bright location when that happens, and then outdoors when appropriate. For evergreens in cold climates, keep the plants in a cool room or building at about 50°F (10°C) with bright light all winter. When the weather warms, move the plants outdoors. You can also leave the potted tree or shrub outside and insulate the roots by wrapping the pot in a few layers of bubble wrap or surrounding it with a wire cylinder filled with leaves or straw. This won't work in extremely cold climates, but it's a great method to try elsewhere.



*Fully hardy trees and shrubs grown in containers will survive the winter without worry. But for cold-sensitive varieties, move them indoors to a cool garage or another area that stays just above freezing.*

*Chapter 8*

# BRINGING IT INDOORS

> *Growing a no-dig garden indoors is a fun way to harvest your own food year-round.*

Outdoor container gardening is fun, rewarding, and a great way to grow your own vegetables, herbs, and flowers when you don't have much space. But many gardeners don't even have space for containers outside their home. So, let's take no-dig gardening indoors as well. While houseplant growing is popular, in this book I'm focusing on growing vegetables, herbs, and flowers. Let me show you how to grow these plants indoors in a no-dig mini garden.

Growing some of your own food and flowers indoors is now easier than ever with new technology, varieties, and growing systems. High-technology indoor growing systems that include hydroponics and aeroponics certainly get a lot of attention. We've all seen stories about grow towers and tunnels in warehouses growing our food. While that technology may be part of our urban agriculture future and available to homeowners as well, I want to keep the focus on the soil. We can go more low-tech in our homes and still produce vegetables, flowers, and herbs year-round.

## Moving Existing Plants Indoors

Growing food and flowers indoors can take many forms. In cold-climate areas, bringing plants indoors in fall will save your favorite vegetables, flowers, and herbs so you can enjoy them in the winter. This may mean growing an indoor herb garden in a sunny window or extending the fruiting of a favorite pepper variety.

Any fruiting vegetable—such as tomatoes, peppers, cucumbers, and beans—needs supplemental lighting in winter to produce fruits. But you can bring these container plants indoors before a fall frost and keep them going

for a few months until the days get too short and light intensity too low for them to survive. Greens will survive later into winter, and I'll talk a little later about ways to grow these veggies indoors year-round.

*The easiest way to have food indoors in winter is to move your existing container veggies and herbs inside in fall to a sunny window. Reduce watering and watch for pests.*

*To increase the variety of vegetables you're growing indoors, consider installing grow lights. You can even grow fruiting plants indoors under lights.*

Herbs are great as indoor plants because perennial versions can last all winter, even in low-light winter areas. Chives, oregano, thyme, rosemary, and lavender are all container herbs that should survive indoors in winter in a bright room. Parsley is a great herb for indoor growing too, but it is a biennial. This means it will send up a flower stalk in late winter. When that happens, the flavor of the leaves turns bitter. So, enjoy parsley all fall and for the holidays, and then compost the plant. I'll talk about setting up an indoor herb garden from scratch on page 118.

Many flowers can overwinter indoors as well, even in cold climates. Geraniums, coleus, and begonias are just some of the traditional bedding flowers that can survive the winter indoors and be placed back outdoors again in spring. While these plants may get leggy from lack of light, they can be pinched back periodically in winter to stay bushy. Once the days get longer in later winter, they will grow stronger and may even flower indoors for you.

## HOW TO BRING PLANTS INDOORS

1. You'll have the most success bringing in edibles and flowers that are already growing in containers. You can move plants from a garden setting into containers then indoors, but you'll have to transplant them well in advance of moving them indoors, so they have time to adjust to containers.
2. Once the weather starts getting cold in the evenings, but before a frost occurs, move your container plants closer to the house or into a protected shady area for a week or so. This will protect them and get them used to lower light levels.
3. Check for any hitchhiking insects on the leaves; handpick them or use an organic spray to kill them before bringing the plants inside.
4. Once indoors, quarantine the plants away from any houseplants for a week or so to watch for any other insects hatching.
5. Place your plants in the sunniest window possible or under grow lights. Some plants, such as peppers, rosemary, geraniums, and coleus, are perennials and can survive and be moved back outdoors in spring. Other plants, such as lettuce and parsley, will eventually flower and die. Enjoy those while they last, then compost them.
6. Transition perennial plants back outdoors in spring gradually, as you did when you brought them indoors in fall.

## Overwintering Rosemary Indoors

I live in a northern climate, and every fall, one plant I always bring indoors is rosemary. This perennial herb is a mainstay for roasting potatoes, cooking eggs, and creating a variety of Italian dishes. For those readers in warm-winter climates, feel free to skip this sidebar. You can grow rosemary as a year-round evergreen landscape plant. I'm jealous!

Here's how the rest of us can overwinter rosemary successfully.

*Rosemary is a beautiful perennial herb that can be brought indoors in cold-winter areas. Reduce watering and place the herb in the brightest window possible to get it to survive.*

- Bring potted rosemary plants indoors when nighttime temperatures start dipping below 40°F (4°C).
- Check for insects and treat if necessary.
- Place the plant in your sunniest south-facing window. The more light, the better. Ideally, this will also be a cool room with temperatures around 60°F (15°C).

- Water sparingly to keep the soil barely moist all winter. Don’t increase humidity around the plant, since that will encourage powdery mildew disease.

*Many herbs, such as oregano, thyme, and chives, are easy to grow in a sunny window indoors. These perennial plants will survive until spring and then can be moved outside again.*

## Growing New Vegetables, Herbs, and Flowers Indoors

Another reason to grow indoors is lack of outdoor space. Apartment dwellers don’t have to despair because they don’t have an outdoor garden or container area. If you have some natural light in your apartment or home, you can grow microgreens. If you want to go further and you have a really sunny room or space for an indoor light setup, you can grow greens, herbs, fruiting vegetables, and some flowers easily indoors. It’s all about your setting and what plants you’re interested in growing.

If you’re trying to grow indoor vegetables to maturity through the winter in a cold climate, you’ll have the best success with indoor grow

lights. I'll talk about those systems on page 117. If you just want to extend your growing season a few months in fall and spring in cold areas, you can get away with growing vegetables, flowers, and herbs indoors in a sunny, south-facing window. The closer to the equator you live, the longer the day length from fall through spring, and the higher the likelihood you can successfully grow indoor vegetables and herbs year-round without lights!

## LEAFY GREENS

The best vegetables for indoor growing in cold-winter areas are leafy greens. Kale, spinach, loose-leaf lettuce, mustard, swiss chard, and arugula can thrive without grow lights if placed in sunny, south-facing windows. The best part about leafy greens is you can harvest them at any time. Harvest when the first true leaves form as microgreens. Wait until a few more sets of leaves grow, then harvest them as baby greens. I talk about the differences below.

You can also try growing root crops such as carrots, beets, and radishes. These require a higher light intensity and take longer to reach maturity indoors. But, the beautiful part of these root crops is, even if they don't form roots to eat, the leaves are edible on all three. You've probably heard of beet greens, but carrot and radish greens are tasty too.

## MICROGREENS

Growing microgreens is a way to produce food indoors, even without lots of light.

Microgreens are basically sprouts that you allow to grow a little longer. But unlike sprouts, microgreens grow in a seed-starting soil mix. It's best to harvest them within 2 to 3 weeks of sowing.

Growing microgreens in a soil mix significantly reduces the chances of harmful bacteria and gives you a sizable greens harvest without the need for supplemental light. Microgreens are grown in trays, so you'll need a good amount of space for them, but you'll get more greens that you can keep longer than if you grew sprouts. Here's how to grow microgreens indoors.

*You can grow greens, such as arugula, spinach, and lettuce, indoors in winter in a bright room when harvesting as microgreens or baby greens.*

*Microgreens are all the rage. They are simply young vegetables and herbs that are allowed to grow to the true leaf stage, then harvested with a scissors.*

*Harvest microgreens by cutting them with a scissors. Some vegetables and herbs, such as peas and basil, can be harvested more than once if you cut them above a lower leaf and let them regrow.*

*Grow microgreens indoors in a bright room or a sunny window. Even if the greens get leggy from lack of light, they are still fine to snip and eat.*

## Growing Microgreens

1. **Decide Which Varieties to Grow**—Salad greens, herbs, and even edible flowers, such as nasturtiums, can all be grown as microgreens. Even leafy veggies, such as broccoli, cabbage, sunflower, and buckwheat, can also be grown and eaten when young. Sow all one type of green or look for commercial microgreen seed mixes.
2. **Get Trays and Soil**—You can use plastic seed-starting trays or recycled plastic salad boxes, take-out dishes, or pie plates as containers. The trays only need to be a few inches deep. There's no need for drainage holes since you'll keep the soil only lightly moist. Fill the trays with a moistened, organic seed-starting soil mix (see more on organic seed-starting soils on page 97).
3. **Light**—Microgreens grow best in a bright window or under grow lights. However, since you are harvesting them when they're so young,

you can grow them in a bright, ambient-light room as well. Your microgreens may grow leggy, but they still will be fine to eat. My sister-in-law is a big microgreen grower, and she has a PVC rack that fits five trays. She sows and harvests greens year-round with just the ambient light in her home.

4. **Sowing**—Sow the seeds on the flattened soil surface and cover them with a thin layer of potting soil. Mist to dampen the soil.
5. **Cover the Tray. Or Don't**—You can cover the seed tray with a plastic top to keep the soil moist and aid germination, but you don't have to. If you don't cover the tray, mist regularly whenever the soil is dry.
6. **Watering**—Keep the soil moist. If you do poke drainage holes in the bottom of the tray, you can use a water-filled, larger-sized drainage tray underneath the growing tray to bottom-water the microgreens.
7. **Harvest**—Once the seeds have sprouted, remove the cover if one was used and allow the seedlings to grow to the true leaf stage (third and fourth leaf). This stage usually occurs about 1 to 3 weeks after sowing. Place the trays in a bright window to avoid leggy seedlings, but even if they do get leggy, they still are fine to eat. Harvest with a scissors, snipping off the tops. Some sprouts, such as peas, will regrow if you snip them just above the lowest leaf. After harvest is finished, compost the soil and start again.

## Growing More Indoor Food

If you have a sunny window that gets more than 6 hours of direct light a day year-round or you're interested in a grow-light setup, then the variety of edibles you can grow indoors expands greatly. You can still grow salad greens, herbs, and edible flowers inside, but now you can let them grow to maturity, yielding bigger crops. Plus, with the right light setup you can consider growing fruiting veggies such as peppers, tomatoes, and beans.

# GROW-LIGHT OPTIONS

If you really want to grow more food and flowers indoors year-round in almost any climate, then you should consider grow lights. My first indoor grow-light setup consisted of shop lights from the hardware store that had large, glaring fluorescent bulbs. The shop lights were painted white and were rather ugly. These lights did work, and I grew great seedlings, but my setup was relegated to the basement because it didn’t look attractive. How times have changed. Now you can get beautifully crafted wooden and metal grow-light setups that look like pieces of furniture. They feature smaller, more energy-efficient and effective lights. You can use these grow lights to start seeds, grow flowering annuals and herbs, and even grow small tomatoes and peppers to maturity.

*Whether it be in a sunny window or under grow lights, you can have a year-round edible garden indoors with minimal care.*

# Indoor Herb Gardens

Many culinary herbs grow well in a sunny window. Perennials herbs, such as chives, oregano, thyme, mint, lavender, rosemary, and sage, can grow year-round in the right location. And we all know there's nothing like the taste of fresh herbs in your sauces, soups, and sautés.

To start your own windowsill culinary herb garden, first evaluate the sun in your window. You should get at least 6 hours of direct sun a day for these herbs to thrive. A south-facing window in winter is usually best.

*Keep your indoor herb garden growing strong in winter by moving plants to a south-facing window or placing them under grow lights. Adding an organic liquid fertilizer in spring will spur new growth.*

Once you find your window, then it's time to get some herbs. While many culinary herbs can be started from seed, since you're probably only growing a few of each type of herb, it's easier to purchase small herb transplants locally. Depending on the size of your windowsill, herbs grow best in 4- to 6-inch (10 to 15 cm) diameter pots with good drainage holes. Place the pots in a water drainage tray to collect excess water. Keep them away from cold window glass in winter.

Use an organic potting mix. Many culinary herbs don't like wet feet, so choose a well-drained soil mix. With an organic potting mix with compost and/ or organic fertilizer added, you won't have to fertilize very often. If leaves lose their color or plants grow slowly, add a dose of liquid organic plant food every few weeks. But culinary herbs have the best flavor when not over-fertilized.

Harvest stems and leaves of your culinary herbs when plants are at least 6 inches (15 cm) tall. Harvesting also keeps the plants bushy and stimulates new, fresh growth, which has better flavor than woody growth. That being said, don't remove more than one-third of the foliage at any one time, since it may shock the plant.

If your herbs seem leggy and are struggling to grow well, they may need more light. You can supplement the window area with grow lights or move your herbs to a separate grow-light setup.

When deciding to purchase a grow-light setup for your home or apartment, you'll need to think about the types of plants you'll be growing and how long they will be under lights. Also consider how visible the unit will be in your living space. Your basic choices in types of grow lights are fluorescent tubes or LED lights. Incandescent lights are too hot and can burn plants.

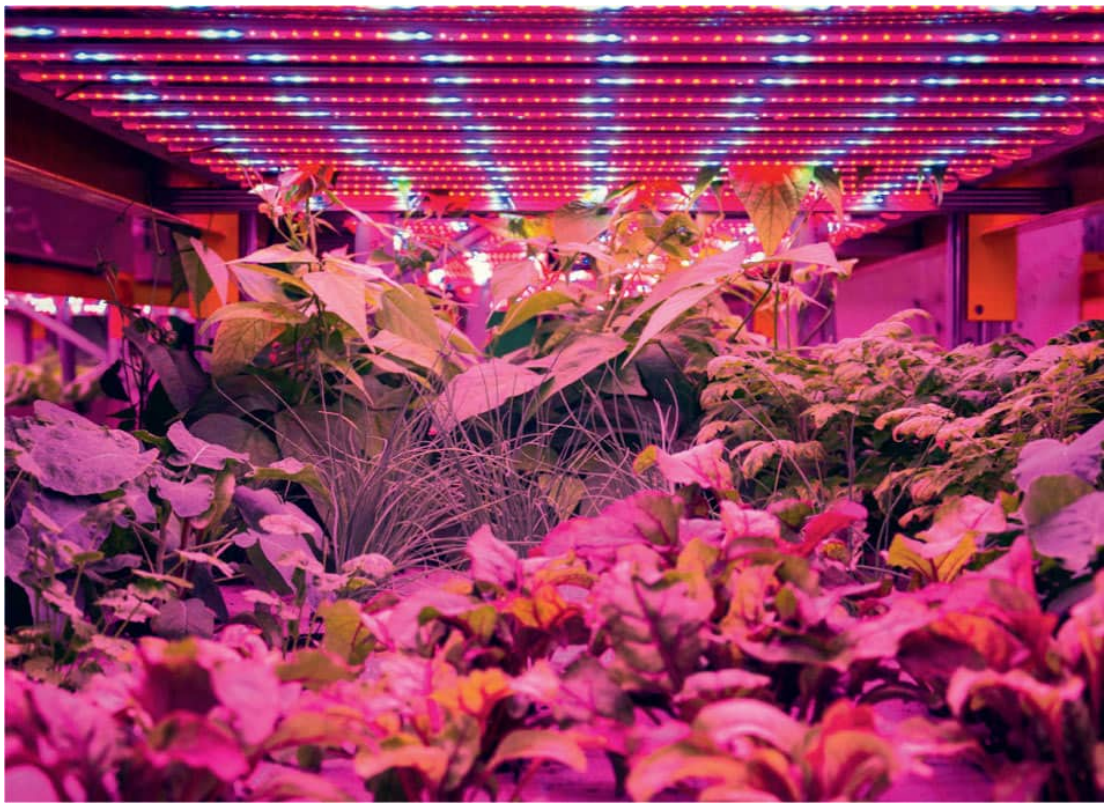
## Fluorescent Lights

Fluorescent tubes have come a long way since my shop light days. They are more compact and energy efficient, and they last longer. They are often sold as T5, T8, and T12 bulbs depending the diameter of the bulb. They're less expensive than LED lights. Use this type for seed starting and also to grow low- to medium-light leafy vegetables, herbs, and some houseplants. They do emit some heat.

## LED Lights

LED lights are now very popular to light homes, and they work great as grow lights as well. They're more efficient, using less energy and directing light toward the plant. They last longer than fluorescent bulbs, are shatter proof, don't contain mercury, and are cooler.

*To really kick up your indoor growing game, buy or make a grow-light setup. Grow lights allow you to grow flowering and fruiting plants, such as peppers and marigolds, indoors any time.*



*LED grow lights save energy, are longer lasting, and have better light for growing than traditional fluorescent lights.*

LED lights work well to start seeds and grow leafy veggies and herbs. With high-output, full-spectrum LEDs, you can also grow flowering and fruiting plants to maturity indoors. The downsides of LEDs are they are more expensive and they emit a brighter light than fluorescents, which may create a distracting glare in your living space. The higher light output bulb you use, the farther away from the tops of your plants the bulbs need to be for optimum growth.

*If you want to grow mature fruiting plants such as tomatoes, make sure you have a large enough grow-light system, equipped with the right bulbs, to accommodate their growth if you don't have a sunny windowsill that receives at least 6 hours of full sun per day.*

The best way to decide on the type of lights you need is to determine what you want to grow and your budget. Then, go to a garden center and look at the different light setups, especially noticing the brightness of the lights and the attractiveness of the units.

While you can purchase a light setup for your home, at right is a simple grow-light setup you can construct to grow seedlings, herbs, flowers, and small vegetables.

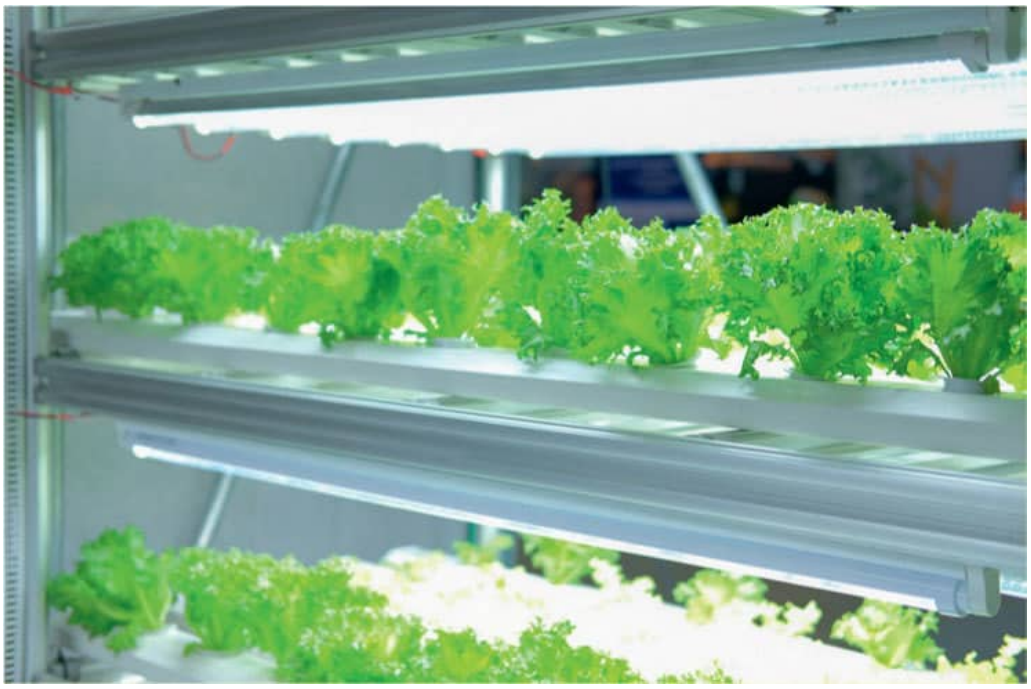
## SOILS AND FERTILIZERS FOR INDOOR PLANTS

It seems like I've strayed a bit off the no-dig topic in talking about microgreens and indoor lights, so let's get back to our main theme: the soil. In chapter 7, I talked about an organic soil mix you can use to grow plants to maturity in outdoor containers. Indoor containers aren't any different. If you're growing foliage houseplants, flowering indoor plants, or vegetables and herbs to maturity, use a well-drained organic soil mix to give your plants the nutrients and biologic life they need. Also, follow the recommendations under Care for Container Trees and Shrubs on page 108 when repotting your indoor perennial plants. Repotting periodically and adding the right mixture of organic materials will help keep your container plant growing strong.

Now that you know all the techniques needed to create a successful and productive no-dig garden both indoors and out, I hope you're excited to proceed with your own food-growing journey. Whether you're building a layered no-dig bed in the backyard, framing a handful of no-dig raised beds, setting up your very first container garden, or growing food in a no-dig indoor growing system, I hope you now find yourself equipped with all the know-how you need for success.

## How to Build a DIY Grow-Light System

1. **The Frame—**Check local home and garden centers for 4-foot (1.2 m) wide wire shelving units. These will come with various tiers, so decide how many shelves you think you need. Most shop lights are sold in 4-foot (1.2 m) lengths; however, there are narrower-length lights and shelves available as well.
2. **What to Grow—**Another determining factor for your light setup is the size of your plants. If you are growing small quantities of short herb plants, leafy greens, or seedlings, you may not need a large light setup. A simple tabletop or countertop light unit may be fine. However, if your goal is to grow large flower and vegetable plants to maturity, or if you want to grow many seedlings for transplanting outdoors, then you will need an adjustable light unit with shelves where you have plenty of room. These units will usually sit on the floor.
3. **Lights—**Decide what you will be growing under the lights. Are you simply starting seeds indoors for a few months in winter, or are you looking to grow plants to maturity? Will you be growing flowering and fruiting plants? How big will they grow? Check out the grow-light options on page 117 to decide which lights would be best.
4. **Power Strip and Timer—**Use a multi-outlet power strip to attach the lights and a timer to the power source. Timers make life so much easier. Set them to turn the lights on for 16 hours a day.
5. **Chains, Hooks, and Pulleys—**Attach the light units to the wire shelves with S-hooks, chains, or a ratcheting pulley system. This allows you to raise and lower the light fixture to keep the light at the right distance from the top of plants for optimum growth. Check your light specifications to know how far away from the plant tops your lights need to stay.
6. **Accessories—**Depending on what you're growing, you may want to invest in heating pads that keep seed-starting soil warm and hasten germination. Also consider a humidity tent to keep the air humid and reduce the need for watering.



*You can buy attractive grow-light systems that look like pieces of furniture in your home, or you can make your own from materials at a home and garden center.*

# RESOURCES

*The Complete Guide to No-Dig Gardening* covers a lot of ground, so to speak. Here are some additional resources related to the major topics covered in the book. I've listed a sampling of books, websites, and YouTube channels to help you further see and understand how to garden without digging.

## BOOKS

*Raised Bed Revolution*, Tara Nolan

*Building Soil*, Elizabeth Murphy

*No Dig Organic Home & Garden*, Charles Dowding and Stephanie Hafferty

*The Ruth Stout No-Work Garden Book*, Ruth Stout and Richard Clemence

*Gaia's Garden: A Guide to Home-Scale Permaculture, 2nd Edition*, Toby Hemenway

*Straw Bale Gardens*, Joel Karsten

*Lasagna Gardening for Small Spaces*, Patricia Lanza

*Container Gardening Complete*, Jessica Walliser

*Year-Round Indoor Salad Gardening*, Peter Burke

## YOUTUBE CHANNELS & WEBSITES

Check out these individuals and groups on their websites and YouTube channels for good information on various no-dig gardening techniques.

*CharlesDowding.co.uk*—English no-dig gardening expert

*OurPermacultureLife.com*—Morag Gamble, Australian permaculturist and no-dig practitioner

*DebTolman.com*—Texas gardener and keyhole gardening expert

*PlantAbundance.com*—Californian YouTube channel with good information on building and growing on hügelkultur beds

*GrowntoCook.com*—Dutch website and YouTube channel with information on growing polyculture vegetable beds

*EpicGardening.com*—Website and YouTube channel with lots of how-to gardening information, including videos on how to grow microgreens from start to finish

*MIGardener.com*—YouTube channel including videos on growing vegetables indoors under lights

*DeepGreenPermaculture.com*—Australian website with good section on no-dig gardening

*GrowVeg.com*—English website and YouTube channel with how-to gardening information

*StrawBaleGardens.com*—Website with practical information on building straw bale gardens

# ACKNOWLEDGMENTS

I’d like to thank all the no-dig gardeners, past and present, who inspired me to write this book. I mentioned many of them in the introduction of this book and in the resource section. Their experimentation and sharing of information inspired a new generation of no-dig gardeners to flourish. A special thanks goes to Jessica Walliser at Cool Springs Press. It was her suggestion to create a no-dig gardening book, and her dedication made this book possible. Thanks for thinking of me to be the author, and thanks for working back and forth with me on the contents of the book. Also, special thanks to Marissa Giambrone for spearheading the art and photography for the book, and to Meredith Quinn for making the editorial and production process run so smoothly. Also, thanks to all the folks behind the scenes at Cool Springs Press for helping make this book happen.

# ABOUT THE AUTHOR

Charlie Nardozzi is an award-winning, nationally recognized garden writer, speaker, and radio and television personality. He has worked for more than thirty years bringing expert gardening information to home gardeners. Charlie delights in making gardening information simple, easy, fun, and accessible to everyone.

Charlie's energy, exuberance, and love of the natural world makes him an exciting public speaker and presenter. He has spoken at national venues such as the Northwest Flower Show, Philadelphia Flower Show, Canada Blooms Flower Festival, master gardener conferences, trade shows, and garden club meetings. If you can't hear him speak in person, consider attending one of his webinars. Charlie has authored seven books, has three radio shows in New England, and hosts a TV show in his home state of Vermont. He's the former host of PBS's *Garden Smart*, reaching more than 60 million households. He's also a consultant for companies and organizations such as Velcro.com, Gardener's Supply Company, and Vermont Community Garden Network promoting gardening for kids, seniors, and veterans. Charlie is also a garden coach and consultant, teaching and inspiring home gardeners to grow the best vegetables, fruits, flowers, trees, and shrubs in their yards.

Charlie leads garden and food tours in Europe, England, and the Americas, including locations such as Sicily and Tuscany, Italy; Provence, France; the Chelsea Flower Show in England; Cuba; and Barcelona, Spain.

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To my wife, Wendy, who is my partner in life and in the garden. Thanks for your hard work and inspiration to make our gardens productive and beautiful.

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